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1951-1952 HORIZONTAL CONTROL SURVEY
1955 EXPANSION
⑥ ENIWETOK ATOLL

200221 MARCH 1st S/S N° 4



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COLLECTION RG 326 ATOMIC ENERGY COMMISSION

BOX No. 199679 (#1089) A16429 326-65AG170
1951-1952 HORIZONTAL CONTROL SURVEY
FOLDER 1955 EXPANSION ENIWETOK ATOLL MARCH 1st
JIS NO 4

HORIZONTAL CONTROL

The horizontal control scheme has been expanded until it now includes the entire Atoll. It consists of a primary network of second order triangulation supplemented with third order stations at locations of lesser importance. The few remaining islands which have not been included in the scheme can be located by single triangles from existing controls.

PREVIOUS SURVEYS

BEST COPY AVAILABLE

Some features of previous surveys were utilized in establishing the scheme. The earliest survey from which records are available was completed in 1944 by the U.S.S. BOWDITCH to control the hydrographic mapping of the Atoll. As this survey was of third order accuracy and most of the stations were not on project islands it was not adaptable to requirements of this project. However, the geographic position of station North Base on Runit Island and the azimuth of the line North Base-Sand became the origin of position and azimuth for the later surveys.

A survey was completed in 1947-48 by the JOINT TASK FORCE SEVEN consisting of a limited scheme covering the eastern portion of the Atoll. The scheme was stated to be of first order accuracy but it was only because of its limited extent that it could be considered of such high order. As the south end of the original base line had been destroyed a new base line, North Base-Runit, was established and the azimuth of the line was computed from its relation to the line North Base-Sand. Expansion of this scheme involved re-occupation of all of its existing stations and it became obvious that

to meet project requirements, a substantially new and stronger scheme was necessary which could be expanded as required.

1949-50 HORIZONTAL CONTROL SURVEY

This survey was designed to meet the requirements of Operation Greenhouse and adaptable to future expansion. It consisted of sixteen stations covering the Eastern portion of the Atoll from Bogallua island to Eniwetok island and included five stations of the previous surveys. As it was determined that Station North Base had been disturbed it was necessary to measure a new base line North Base #2-Runit to second order accuracy. The network expanding from this base line was executed to second order specifications and procedure of the U. S. Coast and Geodetic Survey. The geographical position of Station Runit and the azimuth of the line Runit-Coral, as determined by the previous survey, were adopted as the origin of position and azimuth.

1951 EXPANSION

An expansion of the survey was necessary to meet additional requirements which could not be anticipated earlier. Several additional islands were located by local triangulation and photo tower and zero locations were determined. Local control traverses were established on all project islands. The accuracy of these controls depended on their uses and were generally of third order. The zero lines and some traverses for location of instrumentation were established to first order traverse specifications.

An independent plane coordinate grid was established at each of the zero areas for location of instrumentation. While satisfactory results were obtained it brought out the desirability for an overall Atoll grid.

1952 EXPANSION AND ADJUSTMENT

Requirements for Operation Ivy resulted in the expansion of the scheme to include the entire Atoll. Some stations of the earlier surveys had been destroyed and additional stations were required. Fifteen stations were established, replaced or more precise values determined. As the expansion permitted closing the survey around the Atoll to the Runit base line a check on the previous work was obtained. The closing error of the survey before adjustment was determined as approximately 1:25000. An additional check was obtained by inclusion of the zero line traverse in the Flora-Gene area. This indicated a closing error of approximately 1:70000 before adjustment of the adjacent quadrangle. In order that the values of a station would remain the same independent of the direction of computation through the net an adjustment has been applied to the triangulation figures. This consists of a side equation adjustment which resulted in slight changes in the values previously reported but of little consequence in computations made to date.

PLANE COORDINATE SYSTEM (IVY GRID)

A plane coordinate system has been established which is common to all stations. The origin of coordinates is a plane through triangulation Station Coral with assumed values of N 100,000. East 100,000, at this station. A true meridian through this station was used as the basis of bearings and was determined by computing through the base expansion figure from the adopted azimuth of the Runit base line. The horizontal control network as it now exists should meet

all future requirements with a minimum of field work. Sufficient controls are available to replace destroyed stations and establish required new stations. A new station can be located by forming a strong triangle with any two of the adjusted primary stations.

PRECISE ALIGNMENT

An unusual feature of the survey program was the alignment requirement of the 203 series stations. This included measurement of a zero line to a linear tolerance of not to exceed 1:25000 and establishing a 9000 foot line of sight to a tolerance of plus or minus one quarter inch. Vertical control for this alignment was accomplished by establishing a series of bench marks by precise differential leveling and applying a correction for curvature of the earth. Horizontal control stations were established by night operations with precise equipment and procedures developed to produce the required accuracy. The alignment of the stations was accomplished by offset measurements from these controls to a pre-established working point on each station.

LIST OF HORIZONTAL CONTROL STATIONS - OCTOBER 1952

<u>ISLAND</u>	<u>IVY CODE</u>	<u>STA. NAME</u>	<u>ORDER</u>	<u>REMARKS</u>
Bogallua	Alice	Boga #1	2nd	Destroyed 1951
"	"	Boga #2 - RM-1	2nd	
Bogombogo	Belle	Bogom	3rd	
Ruchi	Clara	Ruchi	"	
Cochiti	Daisy	Cochiti	"	Traverse Sta.
Santildefenso	Edna	Santil	"	" "
Elugelab	Flora	RP-X	2nd	
Teiteirpuuchi	Gene	Teiteir	"	
Bogairikk	Helen	--	-	None
Bogon	Irene	Bogon	3rd	
"	"	RP-Y	2nd	
W. of Engebi	Noah	Noah	3rd	Traverse Sta.
Engebi	Janet	Engebi (Elgin)	2nd	Re-estab JTF-7 Sta.
Muzinbaarikku	Kate	Muzin Pl #1	3rd	
Kirinian	Lucy	Kirinian	"	
Bokonaarappu	Mary	Bokon	2nd	
Yeiri	Nancy	Yeiri	3rd	
Aitsu	Olive	Aitsu	"	
Rujoru	Pearl	Rujoru	"	
Eberiru	Ruby	V Zero	2nd	Destroyed 1951
Aomon	Sally	Aomon	"	Re-estab JTF-7 Sta.
Bijjiri	Tilda	Bijjiri	3rd	Traverse Sta.
Rojoa	Ursula	Jake	"	" "
Aaraanbiru	Vera	Lucy	"	

LIST OF HORIZONTAL CONTROL STATIONS CONTINUED

<u>ISLAND</u>	<u>IVY CODE</u>	<u>STA. NAME</u>	<u>ORDER</u>	<u>REMARKS</u>
Piiraai	Wilma	Piiraai	2nd	
Runit	Yvonne	H. Base #2	"	Destroyed 1951
"	"	" #3	"	
"	"	Runit	"	Adopted JTF-7 Sta.
So. of Runit	Zona	Loc. M	"	Traverse Sta.
" "	--	Reef	"	
" "	--	Islet	"	
Lagoon				
" Photo Tower	Mack	Photo	"	Re-estab JTF-7 Sta.
" Tri. Sta.	Oscar	Coral	"	" " "
" " "	--	Pinnacle	"	Destroyed 1951
Chinieero	Alvin	--		None
Aniyaanii	Bruce	Aniyaanii (Kodak)	"	Re-estab JTF-7 Sta.
Chinimi	Clyde	--		None
Jieroru	--	Lilac	3rd	Re-estab Bowditch Sta.
Japtan	David	Japtan		
Parry	Elmer	Parry	2nd	Destroyed 1951
"	"	Ivy	"	
Eniwetok	Fred	Eniwetok (Privilege)	"	Re-estab Bowditch Sta.
Igurin	Glen	Lantana		USS BOWDITCH Sta.
Mui	Henry	--	-	None
Pokon	Irwin	--	-	"
Ribaion	James	--	-	"
Giriinien	Keith	--	-	"
Rigili	Leroy	Rigili #1	3rd	Destroyed 1951
"	"	" #2	2nd	

VERTICAL CONTROL

There has been no requirement for an overall vertical control network and such a network would involve extensive observations over a considerable period of time. Bench marks for vertical control have been established independently at each of the project areas from tidal observations and the accuracy is considered consistent with project requirements. A check was obtained of the datum established by this method at Eniwetok island when a tide gage was operated at this location for several months during Operation Greenhouse by the U. S. Coast and Geodetic Survey. A differential of 0.14 foot was determined which would be of no consequence in the tidal relation to project structures.

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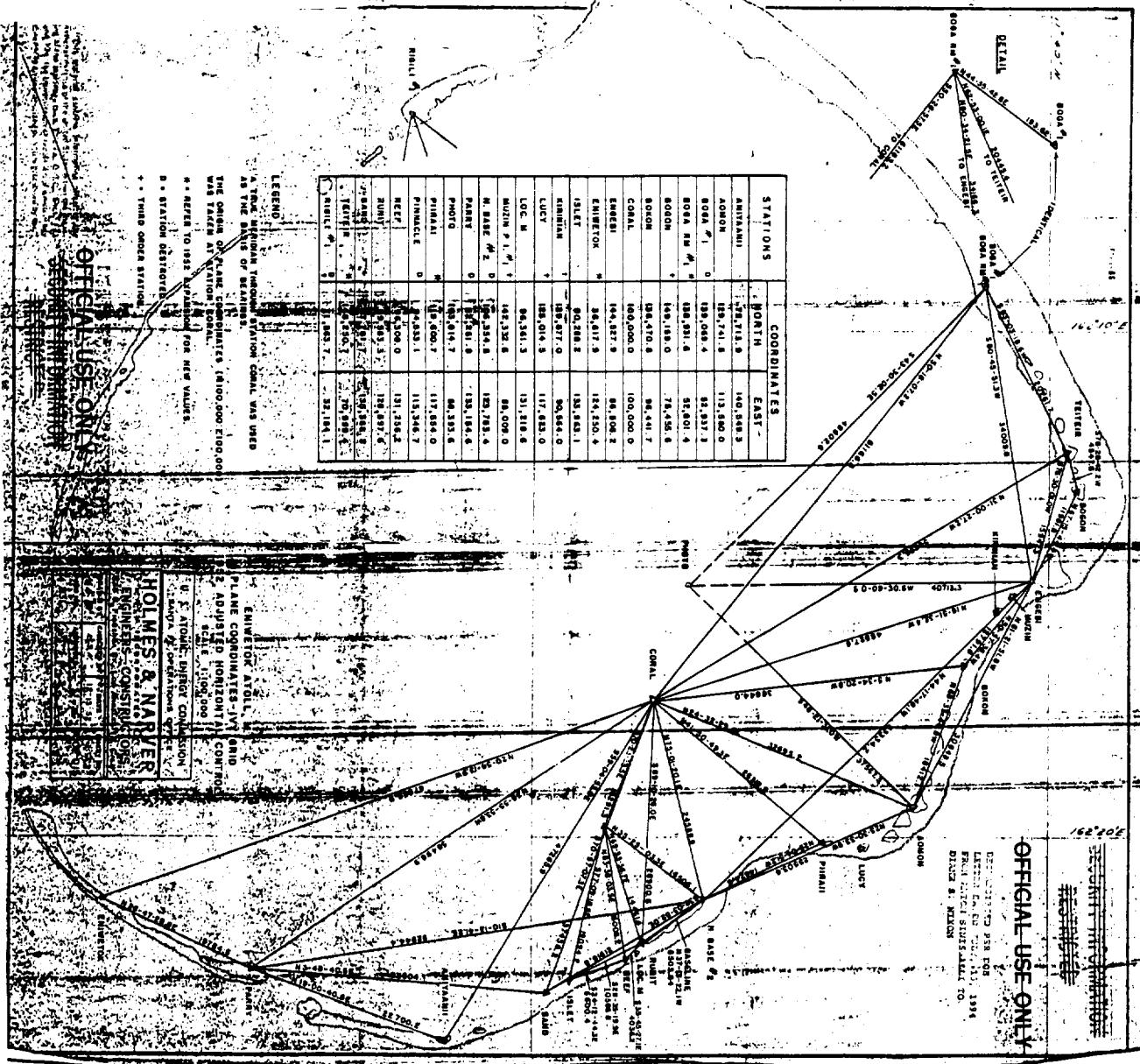
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HOLMES & NASHING INC.
ENGINEERS & CONSTRUCTORS
TRAVERSE COMPUTATIONS

PLANE COORDINATES - IVY GRID
1922 EXPANSION OF HORIZONTAL CONTROL

CALC BY L.S.H.
CHECKED BY L.S.H.

DATE Nov. 1952

LOCATION Enderok Atoll, H.I.

JOB NO. 831

STATION	COURSE	DISTANCE	COSSINE	SINE	LATITUDE				DEPARTURE				COORDINATES			
					NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	SOUTH	EAST	WEST	
1. Coral to ✓	■ 50-28-55.6°	61183.4	63631911	77112555	38932.0				17298.5	138,932.2			100,000.0			
2. Boga #2 ✓	■ 34-18-12.1°	57699.5	82598326	56369466	47658.8				32524.9				52,801.6			
3. RP-X	■ 31-00-27.8°	56295.3	85707088	51515360	148260.6				28000.7				67,475.1			
4. Teletar ✓	■ 16-51-32.1°	46527.6	95702336	29007144	11521.9				14093.8				70,999.3			
5. Engeld ✓	■ 0-55-36.7°	35052.2	99986916	0361768	35017.6				567.0				86,506.2			
6. Teletar ✓	■ 5-11-06.2°	34306.0	99582876	09121188	341162.9				3130.1				100,567.0			
7. Alisim									134.162.9				103,130.1			
8. Buljora	■ 12-37-28.0°	33525.2	97582361	21855958	32711.7				7327.3				132,714.7			
9. Aeson	■ 24-32-29.1°	32695.2	93966667	11555223	29711.5				13546.0				129,714.5			
10. Puratai	■ 11-50-50.7°	26312.7	71192114	66721918	19601.0				17554.5				119,601.0			
11. ■ Base #3	■ 75-01-26.3°	25401.0	96630403	6356.2	23753.9				23753.9				106,354.2			
12. Bunit	■ 89-10-26.0°	2690.6	01111786	99919566	4167.7				28897.5				113,580.0			
13. Sand	■ 70-57-07.3°	37143.8.2	32635970	91621655	12210.3				35288.3				99,583.3			
14. Ivy	■ 34-21-35.7°	57199.0	82250854	56131963	47165.9				87,761.7				128,897.5			
15. Endrotok	■ 20-56-15.2°	67862.7	93397011	35735027	63385.7				21250.7				124,450.7			
16. Riegel #2	■ 67-27-15.6°	73116.9	38928531	92362999	28135.6				67810.0				36,618.3			
17.									71,880.4				71,880.4			
18. Boga #2 to	■ 59-09-59.8°	9659.5	51251333	88866336	1910.6				52,510.1				132,451.9			
19. Buchi	■ 80-31-21.7°	31166.0	16318117	98649659	5595.7				63385.7				123,872.8			
20. Engeld	■ 17-01-57.0°	70167.4	95588278	293710838	67071.8				20621.6				86,506.2			
21. Riegel #2									71,880.4				32,190.0			
22.																
23. RP-I to	■ 73-51-41.5°	9665.76	27709339	90081309	2661.7				117,658.8				67,415.1			
24. RP-I									9229.6				150,320.5			
25.													117,658.8			
26. Engeld to	■ 88-31-27.0°	25136.0	02555530	99966828	6532.1				14093.8				136,527.9			
27. Ruchid	■ 80-39-28.0°	19286.9	10233101	98673636	3130.9				19031.1				143,872.8			
28. RP-X	■ 76-30-03.1°	1591.5	23343075	97237343	3722.7				15506.9				147,658.8			
29. Tel Fair	■ 59-25-02.9°	11385.2	50871891	86087721	5792.6				9801.5				118,750.6			
30. Riegel									150,320.5				150,320.5			

HOLMES' MANUFACTURING INC.
ENGINEERS-CONSTRUCTORSPLANE COORDINATES - TYPED
1032 EXPANSION OF HORIZONTAL CONTROL

TRAVERSE COMPUTATIONS

CALC. BY J.S.H. DATE 10-10-52

JOB NO. 831 LOCATION Estimator Atoll, N.I.

STATION	COURSE	DISTANCE	COSINE	SINE	LATITUDE	DEPARTURE			COORDINATES		
						NORTH	SOUTH	EAST	WEST	NORTH	SOUTH
1 Point to	S 80-28-00.5°	3573.5	10560161	98619393	59.8	3524.2	117658.8			108250.6	10999.3
2 RP-X	S 70-03-33.6°	6069.3	3411685	90001630	2069.9	5705.4			150320.5		
3 RP-Y											
4										129741.5	
5 Axon to	S 67-49-00.7°	11053.2	37756831	92598174	5306.1	13013.0			100567.0		
6 Yerl	S 67-03-39.7°	11316.7	38966115	92095630	1121.1	1165.9	135047.6		103130.1		
7 Aten	S 67-31-08.6°	6923.6	429112295	90310350	2973.2	6252.7	132714.7	10727.3			
8 Rajom											
9										11751.5	
10 Pirred to	S 29-32-16.9°	23008.0	87002868	49300112	2003.7	11313.0			99583.3	128897.5	
11 Runit	S 35-01-15.7°	11625.7	9057235	42387319	1301.8	6399.4			106351.2	123753.9	
12 N. Base #3											
13										106351.2	123753.9
14 N. Base #3	S 37-13-21.0°	8503.0	79629213	62191186	677.9	5113.6	99583.3		128897.5		
15 Runit											
16										87781.7	135588.3
17 Sand to	S 0-59-16.9°	27951.1	99991180	01738891	2797.9	186.6			59804.0	135874.9	
18 Japan	S 4-45-11.1°	35369.7	99651778	08302127	3521.6	2936.4			52634.1	132151.9	
19 Ivy	S 8-46-34.3°	28634.9	98829186	15257523	2829.7	1369.0	59102.0		131019.3		
20 Idiac	S 12-16-51.3°	52361.6	97711647	21270195	5116.4	11137.6	36618.3		121250.7		
21 Eriwetok											
22										52531.1	132151.9
23 Ivy to	S 11-39-00.7°	7094.1	97939871	20193601	6948.1	1132.6			59482.0	131019.3	
24 Lille	S 25-12-38.0°	8036.2	90171160	12391598	720.7	3123.0			59801.8	135874.9	
25 Japan											
26										36618.3	121250.7
27 Estimator to	S 69-03-08.8°	98575.8	35751327	93390806	35212.1	92060.7	71860.1		32590.0		
28 Right #2	S 27-15-10.4°	17904.5	88892744	15801803	15915.8	8201.2	52534.1		132151.9		
29 Ivy											
30											

STATION	COURSE	DISTANCE	COSINE	SINE	LATITUDE		DEPARTURE		COORDINATES			
					NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
1 Engabi to	N 67-15-44.1W	11981.8	138651244	922280119	4631.1		11050.6		244527.9		86,506.2	
2 Bogen	S 61-21-31.8E	30818.5	17732256	87763881	11786.1		21073.8		119,152.0		75,155.6	2
3 Ason	S 50-57-36.4E	12791.8	62986128	77670764	8051.1		9936.5		129,741.5		133,580.0	3
4 Bolton	S 44-17-48.7E	53334.2	75573302	69837380	30173.1		37217.2		136,170.8		96,111.7	4
D 5 N. Base #2	S 0-09-30.6W	40713.3	99999617	00276634	10713.2		112.6		-106,256.8		123,753.4	5
6 Photo	N 46-10-31.9W	4133.9E	69244090	72217160	2862.5		2982.6		103,811.7		86,392.6	6
D 7 E Zero									117,390.4		83,522.6	7
8												8
9 Atom to	N 68-33-45.8W	18412.1	36518217	930811823	6729.3		3738.3		129,711.5		113,580.0	9
10 Bolton	S 23-30-33.9E	25503.6	9169452	39889979	2338.7		20173.4		136,170.8		96,111.7	10
D 11 N. Base #2	S 16-21-31.0W	37567.3	69031249	72367351	5926.6		2786.4		106,354.8		123,753.4	11
12 Photo	N 56-01-33.8W	41140.9	55801583	82929178	2314.0		3134.0		102,611.7		86,392.6	12
D 13 V Zero									132,035.5		110,116.0	13
14												14
D 15 N. Base #2 to	N 25-04-51.2W	14621.8	90571024	12389735	13215.9		6199.1		106,354.8		123,753.4	15
16 Piraeal	S 37-13-22.1E	8533.8E	79328921	80491612	9711.5		52111.2		119,600.7	*	117,551.0	16
17 Runit	S 32-03-52.0E	21916.5	84714512	53087279	105731.1		116311.9		39,593.2		126,897.6	17
18 Sand	S 10-13-41.2E	52916.4	9811010861	17756759	52101.9		9101.2		87,781.7		35,388.3	18
D 19 Party	S 35-25-03.3E	11566.1	81191999	57953129	11821.7		8106.7		51,251.9		133,159.6	19
D 20 Pinnacle	S 72-40-16.9E	591.3	29785206	95161204	176.1		564.5		91,533.1		125,346.7	20
D 21 C Zero									106,117.7		124,317.9	21
22												22
23 Runit to	S 35-45-27.1E	1036.2	81149722	58435629	3275.8		2358.6		99,531.3		128,897.6	23
24 Reef	S 28-35-19.7E	10535.8	87070730	47851116	92851.1		5085.5		96,308.0		131,286.2	24
25 Islet	S 69-33-36.7W	11161.4	34922313	93703959	5090.2		33550.9		90,288.2		133,963.1	25
D 26 Pinnacle									94,533.1		125,346.7	26
27												27
28 Reef to	S 21-12-44.3E	6600.4	91203205	41011893	6019.8		2706.9		96,308.0		131,256.2	28
29 Islet	S 0-38-03.5W	16008.2	11087390	92939448	1739.9		15901.5		90,288.2		133,963.1	29
D 30 Pinnacle									94,533.1		125,346.7	30

TRAVERSE COMPUTATIONS

PLANE COORDINATES - IV GRID
1952 ADJUSTED HORIZONTAL CONTROL

CHECKED BY L.S.R. DATE Book 1952

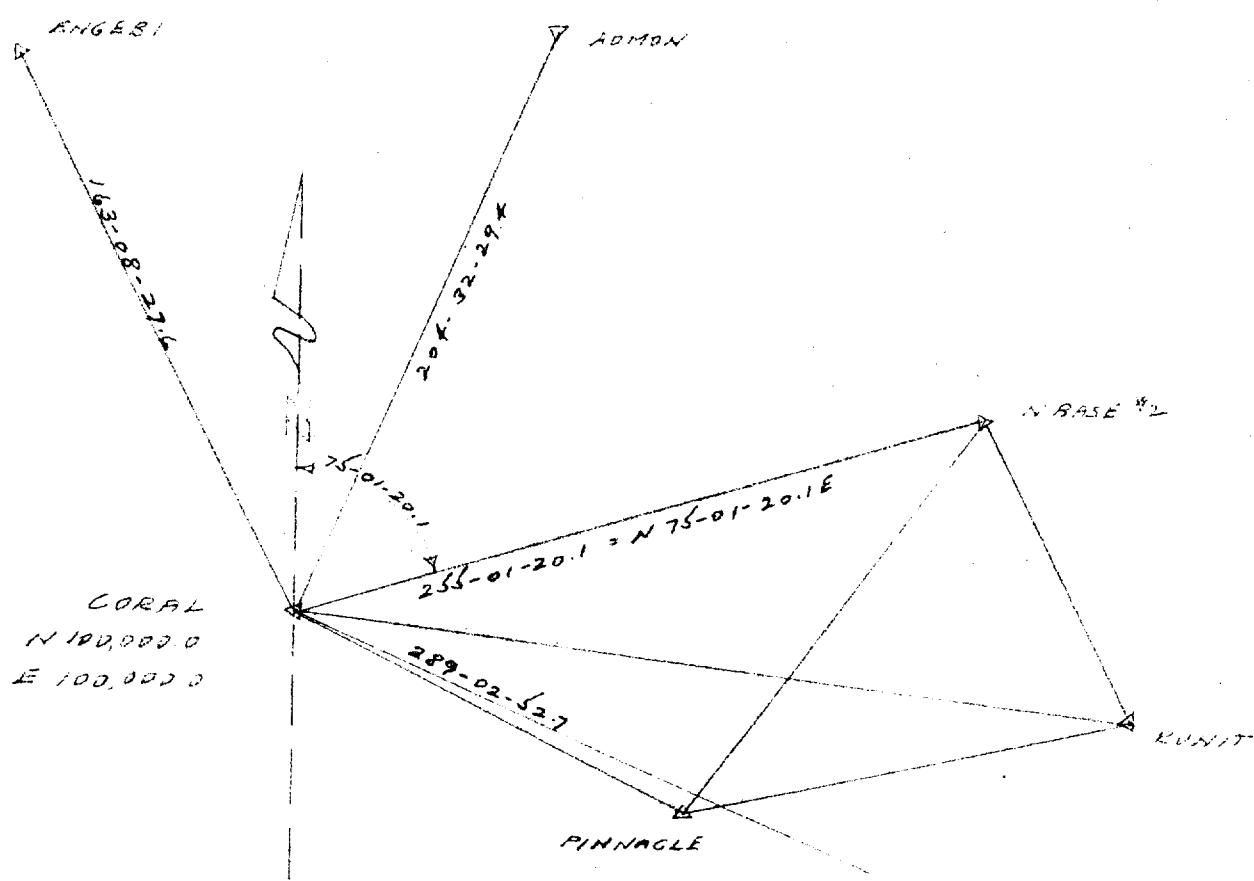
JOB NO. 831 LOCATION: Bintotok Atoll, N.I.

STATION	DEVIANCE	DISTANCE	COSINE	SINE	LATITUDE		DEPARTURE		COORDINATES	
					NORTH	SOUTH	EAST	WEST	NORTH	SOUTH
D 1 Pinnacle to	S 77-02-15.88	19.00% .2	22211053	971697592	1211.9	18616.4			91.533.1	115.346.7
2 Islet									20,288.2	133,963.1
3										
D 4 Party to	N 34-10.58	.33601.1	99778804	06439.82	33929.8	2233.7			51,251.9	133,154.6
5 Sand	N 19-00-10.58	22700.2	94505163	3575380	2162.0	7391.7			87,781.7	135,388.3
6 Aniyamid									75,713.9	140,519.3
7										
8 Bintotok to	N 26-17-28.08	19751.5	89265131	15071260	1751.0	8904.2			36,517.9	121,250.4
9 Party									51,251.9	133,154.6
10										
11 Busin to	N 31-23-11.37	2660.4	82515672	56489220	2195.3				112,332.6	88,009.3
12 Engabi	N 13-31-03.01	6780.2	74817457	66350193	5057.8				114,227.9	86,506.2
D 13 E Zero									117,390.4	83,523.6
14										
15 Kirrian to	N 11-06-13.37	6112.3	75352100	65712384	1650.9				139,877.0	90,561.0
16 Engabi	S 59-54-27.68	6793.3	50139399	86521852	3406.2	5877.7			114,527.9	86,506.2
17 Bolon	S 13-18-16.58	40978.2	97312699	23028912	3987.0	9436.0			136,170.8	96,443.7
18 Coral									100,000.0	100,000.0
19										
20 Lucy to	N 10-32-21.88	6220.2	75995931	61997079	1727.1				125,024.4	117,623.0
21 Aomen	N 16-43-10.68	10270.5	68556921	72800746	7011.1				1043.0	20
D 22 V Zero									129,741.5	113,580.0
23									7477.0	21
24 Loc. N to	S 35-06-13.37	65.27	81811264	57505801	52.3	37.5			132,055.5	22
25 Beef	N 35-06-13.37	12000.0	81811264	57505801	9817.4				110,146.0	23
D 26 C Zero										24
27										25
28 Riffili #1 to									96,361.3	131,218.6
29 N. Base #2	N 69-21-37.08	97819.7	35219052	92501538	31,491.0	91569.35			71,963.7	32,181.1
30 Engabi	N 36-46-51.38	90721.7	80093051	59875687	72661.21	51322.01			106,354.8	123,753.4
									114,527.9	86,506.2
										30

BY A.R.B. DATE Feb 1947
CHKD. BY [initials] DATE Feb 1947

SUBJECT TERRITORY SURVEYED AND GRID
ORIGINATES - IVY GRID

SHEET NO. 1 OF 1
JOB NO. 221
IVY GRID



ORIGIN OF COORDINATES - IVY GRID

An assumed origin of N 100,000.0 E 100,000.0
was taken at station CORAL.

A true meridian through this station
was based on the adjusted forward azimuth
of the line CORAL - N BASE #2 as determined
by the 1902 adjustment.

Due to the limited extent of the survey
no errors introduced by the plane grid
will affect the geometric distances.

(NOTE: The following is an excerpt from letter SEN-137, dated 13 February 1952,
from D. T. Robbins, Chief Engineer, HAN, to Manager, A.E.C., Albuquerque, N.M.)

The relation between local grids used for the "Greenhouse" computations and the new Atoll grid is as follows. This is based on the difference in bearings of the zero lines as computed from the two systems, and gives the relation of structure 6A to zero at each of the three locations.

Location Janet

	<u>Sta. Zero</u>	<u>Sta. 6A</u>
"Greenhouse" coordinates	N 5,051.77 E 945.73	N 2,307.86 E 3,821.76
"Ivy" "	N 147,390.40 E 83,523.60	N 144,637.95 E 86,391.46
"Greenhouse" bearing	Zero to Sta. 6A	S 46° 20' 48"E
"Ivy" "	" " " "	S 46° 10' 35"E

Difference

0° 10' 13"

Location Ruby

	<u>Sta. Zero</u>	<u>Sta. 6A</u>
"Greenhouse" coordinates	N 11,148.91 E 3,153.21	N 7,939.90 E 8,311.49
"Ivy" "	N 132,055.50 E 110,146.00	N 128,847.06 E 115,304.64
"Greenhouse" bearing	Zero to Sta. 6A	S 58° 06' 50"E
"Ivy" "	" " " "	S 58° 07' 13"E

Difference

0° 00' 23"

Location Yvonne

	<u>Sta. Zero</u>	<u>Sta. 6A</u>
"Greenhouse" coordinates	N 15,058.71 E 953.33	N 11,947.10 E 3,426.89
"Ivy" "	N 106,178.70 E 124,317.80	N 103,067.64 E 126,792.05
"Greenhouse" Bearing	Zero to Sta. 6A	S 38° 28' 58"E
"Ivy" "	" " " "	S 38° 29' 44"E

Difference

0° 00' 46" 58"

To determine the location of any structure based on the "Ivy" coordinate system, apply the difference in bearings between grids at the particular location to the "Greenhouse" bearing. From the adjusted bearing and the given distance from zero to a structure compute the difference in coordinates to be applied to the "Ivy" coordinates of zero.

DECLASSIFIED BY: DDC
DATE: 04 JULY 1996
DDC: 04 JULY 1996
BY: 04 JULY 1996

HOLMES & SAWING INC.
ENGINEERS & CONTRACTORS

GEOGRAPHIC POSITIONS

FINAL CONTROL

1952

JOB NO. 831

LOCALITY ENTREPOK ATOLL, N. I.

DATUM ENTREPOK ASTRODYNAMIC - 1944

SECOND ORDER TRIANGULATION

TO STATION

LOGARITHM METERS

METERS FEET

HODGES, STANLEY INC.
ENGINEERS-CONTRACTORS

JOB NO. 851

GEOGRAPHIC POSITIONS

1962 EXPANSION OF HORIZONTAL CONTROL

EXTENDED ASTRONOMIC - 1944

ORDER TRIANGULATION

LOCALITY	DATUM	SECOND	SECOND	TO STATION				DISTANCE		
				STATION	LATITUDE AND LONGITUDE	SECONDS IN METERS	BACK AZIMUTH	LOGARITHM METERS	METERS	FEET
Riv. Y.	N 11-40-39.409			300-34-09.81	E 162-15-16.607	12-3-29.8	Bukid	5.5403592	3470.22	11395.2
Yerit	N 11-38-41.904			315-08-00.2	E 162-14-55.151	16-6-27.6	Coral	4.1317265	14181.64	46527.6
Atteu	(+)	N 11-37-07.923		292-11-00.4	E 162-17-16.550	11-11-26.8	Adon	3.6317936	4283.42	14055.2
Rujoru	(+)	N 11-37-59.161		292-55-06.5	E 162-17-02.440	11-56-27.7	Adon	3.5988933	3465.48	11346.7
Pirai		N 11-37-14.785		236-56-55.2		115-26-16.8	Adon	3.3243483	2110.22	6923.6
Adon		N 11-37-15.263		24-32-56.8		20-32-29.4	Coral	3.6985000	9965.52	32695.2
		E 162-19-27.554								
		N 11-36-54.692		354-55-49.6		15-56-02.1	N. Base #5	3.6401323	4457.52	14525.7
		E 162-20-37.557								
N. Base #3	N 11-35-25.262			522-47-26.8	E 162-21-08.898	14-47-37.2	Runit	3.4125881	2691.72	8803.0
Runit	N 11-32-16.080			90-50-32.2		270-49-34.0	Coral	3.9446227	8608.92	28900.6
Sand	N 11-50-18.866									
	E 162-23-06.570			359-01-24.0		11-51-24.9	Jeptan	3.8368808	6328.66	27921.1
				4-46-55.0		19-56-49.1	Ivy	4.0323473	10780.71	35339.7
				8-47-45.2		18-47-35.6	Lilac	3.9409113	8727.93	28634.9

GEOGRAPHIC POSITIONS

MOA NO. 831

GEOGRAPHIC POSITIONS

JOB NO. 831

1952 ADJUSTED HORIZONTAL CONTROL

LOCALITY ENIWETOK ATOLL, M. I.

DATUM ENIWETOK STTHONOMIC - 1944

SECOND ORDER TRIANGULATION

STATION	LATITUDE AND LONGITUDE	SECONDS IN METERS	AZIMUTH	TO STATION	DISTANCE			
					LOGARITHM METERS	METERS	FEET	
Parry (D)	N 11-24-46.973	26-48-55.1	26-17.4	Eniwetok	5.7796816	6021.13	19754.5	
	E 162-22-44.935							
Eniwetok (*)	N 11-21-51.466	159-04-34.6	33-06-46.5	Coral	4.9156450	20531.65	67862.9	
	E 162-21-14.726							
Mugia	N 11-33-20.189	145-35-54.3	32-35-55.3	Iwobi	2.9069619	610.59	2650.4	
	E 152-15-10.277	135-26-32.6	31-05-23.5	V-Zero	3.5135974	2056.51	8769.2	
Kirinian	(+)	N 11-38-56.831	138-53-27.5	31-53-13.2	Egabi	3.2744657	1811.32	6172.3
	E 162-15-35.991	300-05-13.2	12-01-25.1	Boron	3.3160982	2070.51	6793.3	
Lay	(+)	N 11-56-28.384	139-28-18.8	31-28-05.6	Aman	3.2778655	1391.92	6220.2
	E 152-20-28.256	135-17-25.0	31-17-03.9	V-Zero	3.4955467	213-45	10270.55	
Phuto	N 11-32-58.088	180-03-03.1	-09-03-03.3	Iwobi	4.0937822	12439.44	47013.3	
	E 162-14-54.272							
R1611 #1 (0) (+)	N 11-27-40.914	215-14-34.9	3-16-24.0	Iwobi	4.4617415	27632.44	90724.7	
	E 162-0-43.977	243-13-20.5	6-22-22.3	ii. Base #2	4.4745754	29624.65	97849.7	
V-Zero (D)	N 11-40-10.366	313-48-51.6	13-48-57.7	Iwobi	3.1003843	1260.04	4153.985	
	E 162-14-26.132							
V-Zero (D)	N 11-37-38.242	308-58-46.6	12-53-53.6	Aman	3.1011110	1622.15	4142.2	
	E 162-18-53.034							
C-Zero (P)	N 11-33-21.519	1-7-20-32.0	2-7-20-30.9	No. Base #2	2.2659030	180.22	591.27	
	E 162-21-15.570							

Note: (0) = Refer to 1952 Expansion for new values (+) = Third Order station.

Note: (0) = Refer to 1952 Expansion for new values (+) = Third Order station.

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Pacific Southwest Region

BENCH MARKS

STATION	EL. E.	EL. S.	PAGE	DATE	DESCRIPTION	CONC.	F.S.	516	REMARKS
ALICE BOGA #2	8.675	20	21	1-10-50	H&N DISC, CONC. MON.			CLOSED CIRCUIT FROM STA. BOGA (STA. BOGA TIDE OBSERVATIONS)	
BELLE P.I. "A"	8.06	148	22	10-12-51	COPPER PIPE, LEAD &			RUN FROM BOGA #2	
CLARA P.I. "E"	8.16	151	25	11-14-51	TACK, CONC. MON.				
CLARA P.I. "R"	6.57	157	2	2-15-52	H&N DISC, CONC. MON.	F.S.	537	CLOSED CIRCUIT FROM P.I. "A"	
RUCHI	9.72	157	16	2-20-52	H&N DISC, CONC. MON.	F.S.	550	CLOSED CIRCUIT FROM P.I. "E"	
DAISY PYNE	7.80	157	16	2-20-52	ALUM. PIPE & CAP, CONC. MON.	F.S.	550	CLOSED CIRCUIT FROM P.I. "R"	
CHITI	8.39	157	16	2-20-52	ALUM. PIPE & CAP, CONC. MON.				
EDNA SAM	6.87	158	5	2-26-52	ALUM. PIPE & CAP, CONC. MON.	F.S.	554	CLOSED CIRCUIT FROM P.I. "R"	
FONSO	(8.86 (8.53)	158	5	2-26-52	ALUM. PIPE & CAP, CONC. MON.	F.S.	555	CLOSED CIRCUIT FROM CHITI	
FLORA R.P. "X"	8.965	164	17	2-27-52	ALUM. PIPE & CAP, CONC. MON.	F.S.	555	CLOSED CIRCUIT FROM CHITI	
FLORA SLUG	8.115	152	5	5-8-52	H&N DISC, CONC. MON.	F.S.	543	CLOSED CIRCUIT FROM ELUG	
ELAB	10.09	152	5	11-20-51	H&N DISC, CONC. MON.	F.S.	543	CLOSED CIRCUIT FROM ELUG	
GENG PUCCHI	9.215	152	20	12-3-51	H&N DISC, CONC. MON.	F.S.	543	CLOSED CIRCUIT FROM TEITEIR	
INTER "X"	8.07	152	20	12-3-51	H&N DISC, CONC. MON.	F.S.	543	CLOSED CIRCUIT FROM TEITEIR	
TENT POLE T	6.81	155	12	2-1-52	ALUM. PIPE & CAP, CONC. MON.	F.S.	543	CLOSED CIRCUIT FROM TEITEIR	
TEITEIR	8.545	158	20	3-1-52	H&N DISC, CONC. MON.	F.S.	543	CLOSED CIRCUIT FROM TEITEIR	
HELEN BOG AIR	6.51	152	20	12-3-51	ALUM. PIPE & CAP, CONC. MON.	F.S.	543	TIDE OBSERVATIONS	
RIKK	5.29	152	20	12-3-51	ALUM. PIPE & CAP, CONC. MON.	F.S.	543	CLOSED CIRCUIT FROM TEITEIR	
IRENE JIK	6.59	156	26	2-14-52	ALUM. PIPE & CAP, CONC. MON.	F.S.	543	CIRCUIT NOGOB TO BOGON	
NOGOB	5.75	152	20	12-3-51	ALUM. PIPE & CAP, CONC. MON.	F.S.	543	CLOSED CIRCUIT FROM TEITEIR	
BOGON MARI	7.15	152	20	12-3-51	H&N DISC, CONC. MON.	F.S.	543	CLOSED CIRCUIT FROM TEITEIR	
JANET ENGEBI LADEDA	10.99 10.08	156 10	26 18	2-14-52 5-14-59	ALUM. PIPE & CAP, U.S.C.&G.S., CONC. MON.	F.S.	543	CIRCUIT NOGOB TO BOGON	
T.A.K.	9.39	43	14	6-2-50	H&N DISC, CONC. MON.	F.S.	73	TIDE OBSERVATIONS	
R.P. 4	9.09	69	23	9-13-50	NAIL IN CONC. MON.	F.S.	73	CLOSED CIRCUIT FROM ENGEBI	
R.P. 3	9.86	168	7	4-28-52	20MM SHELL IN CONC. MON.	F.S.	73	CLOSED CIRCUIT FROM ENGEBI	
		168	27	5-3-52	H&N DISC, CONC. MON.	F.S.	73	CIRCUIT, TANKS TO R.P. 4	

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FROM ARON SINISCALLI TO

DIANE G. WILSON
DATED JULY, 15, 1994

SECRET

REMARKS

BENCH MARKS

STATION	FIELD BOOK	DATE	DESCRIPTION	REMARKS
FRED	B.M. 53-J	11.78	LIST OF VALID BENCHES	S.W. COR SLAB BLDG. #84
	B.M. 53-K	15.67	LIST OF VALID BENCHES	S.E. COR. OF W. STEP BLDG. #90
P.I. #6	8.55	203	19	4-21-53
P.I. #8	10.49	208	19	4-21-53
P.I. #10	15.33	203	19	4-21-53
P.I. #12	11.81	204	17	6-1-53
P.I. #15	12.01	203	19	4-21-53
P.I. #17	12.16	203	19	4-21-53
P.I. #20	9.59	203	19	4-21-53
P.I. "B"	9.66	203	19	4-21-53
P.I. "E"	14.76	203	19	4-21-53
P.I. "F"	15.92	203	19	4-21-53
WILSTICK	11.48	LIST OF VALID BENCHES	4-21-53	
USC & GS #3	10.90	LIST OF VALID BENCHES	CONC. MON.	
PANSY	10.40	LIST OF VALID BENCHES	USC & GS DISC IN CONC. MON.	
VIOLET	12.25	LIST OF VALID BENCHES	STANDARD H&N DISC IN CONC.	
ROSE	11.61	LIST OF VALID BENCHES	STANDARD H&N DISC IN CONC.	
				STANDARD H&N DISC IN CONC.

NOTE:

STANDARD H&N DISC IN CONCRETE IS A 2 5/8" DIA BRASS DISC SET IN A CONCRETE MONUMENT FROM 6 TO 8 INCHES BELOW GROUND ELEVATION, WITH NAME OR NUMBER DESIGNATION STAMPED ON ITS FACE.

REFERENCE TO "LIST OF VALID BENCHES" REFERS TO LIST ASSEMBLED, ADJUSTED AND REPRODUCED FROM VARIOUS LEVEL CIRCUITS ON SITE, FRED.

RECORDED AND INDEXED
PACIFIC SOUTHWEST REGION
FEBRUARY 1994
FEDERAL SURVEYING SECTION
DIAHNE S. RICHARD

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BENCH MARKS

STATION	ELEV.	FIELD BOOK	PAGE	DATE	DESCRIPTION	REMARKS
KATE MUZIN P.I. "A"	6.40 8.72	28 141	27 28	3-30-50 6-31-51	CONC. MON. STANDARD H&N DISC. IN CONC.	TIDE OBSERVATIONS CLOSED CIRCUIT FROM MUZIN
LUCY BEACON "M" R.P. "A" R.P. "B"	8.60 6.71 7.09	37 142 142	7 5 5	4-12-50 6-15-51 6-15-51	USN CONC. MON. STANDARD H&N DISC IN CONC. STANDARD H&N DISC IN CONC.	TIDE OBSERVATIONS CLOSED CIRCUIT FROM BN "M" CLOSED CIRCUIT FROM BN. "M"
MARY BOKON MATT BOOK	10.40 9.53	31 159	6 10	3-27-50 4-3-52	CONC. MON. CONC. MON.	TIDE OBSERVATIONS CLOSED CIRCUIT FROM BOKON
NANCY NICK YEIRI JON	10.54 9.96 10.95	159 159 207	10 25	4-3-52 4-3-52 11-14-53	CONC. MON. CONC. MON. ALUM. BOLT IN CONC. MON.	CIRCUIT BOKON TO RUJURO CIRCUIT BOKON TO RUJURO CIRCUIT FROM YEIRI
OLIVE OMAR AITSU EATON EVY	11.57 10.05 13.51	159 159 207	21 21 22	4-3-52 4-3-52 11-13-53	CONC. MON. CONC. MON. CONC. MON.	CIRCUIT BOKON TO RUJURO CIRCUIT BOKON TO RUJURO CIRCUIT FROM AITSU
PEARL PAUL RUJURO TENT POLE "J" TENT POLE "K" TENT POLE "L"	9.73 10.90 9.33 13.88 11.62	159 159 207 207 207	8 9 24 24 24	4-7-52 3-21-52 11-14-53 11-14-53 11-14-53	CONC. MON. CONC. MON. CONC. MON. CONC. MON.	CIRCUIT BOKON TO RUJURO CLOSED CIRCUIT FROM BOKON CLOSED CIRCUIT FROM RUJURO
RUBY RUBY SALLY AOMON DUKE DAN	8.87 8.41 6.10 12.40	212 212 202 202	26 26 11 12	11-11-53 11-12-53 5-12-53 5-12-53	STANDARD H&N DISC IN CONC. STANDARD H&N DISC IN CONC. STANDARD H&N DISC IN CONC.	CLOSED CIRCUIT FROM RUJURO CLOSED CIRCUIT FROM RUJURO CLOSED CIRCUIT FROM RUJURO
TILDA JACK JEAN IOWA KATE R.F. KATE UTAH LUKE VERA LUCY BEACON "K"	7.18 8.78 7.95 8.66 8.33 8.34 10.94 8.44 12.22	202 202 202 202 202 202 207 207 33	11 11 11 11 11 11 20 20 2	5-12-53 5-12-53 5-12-53 5-12-53 5-12-53 5-12-53 11-11-53 5-12-53 12-()-50	STANDARD H&N DISC IN CONC. 6" CENTER PUNCHED BOLT IN CONC. STANDARD H&N DISC. IN CONC.	DISTURBED ABOUT 5-1-53 CIRCUIT SALLY-URSULA
WILMA PIIRAI STA. 60 STA. 62	8.80 9.88 9.55	24 124 124	22 18 18	1-20-50 3-9-51 3-19-51	CONC. MON. ✓ CHISELED IN SE PTG OF NE TOWER ✓ CHISELED IN SE PTG SW	TIDE OBSERVATIONS CLOSED CIRCUIT FROM PIIRAI
YVONNE #59 USC&GS NO BASE #26 (LT)	4.26 6.60 23.40	104 104 104	16 16 16	5-23-51 5-23-51 5-23-51	NOT AVAILABLE U.S.C. & G.S. CONC. MON. NOT AVAILABLE	C.C. FROM TRAVERSE RUNIT CC. FROM TRAVERSE RUNIT C.C. FROM TRAVERSE RUNIT
					DECLASSIFIED PER DOE	
					LETTER DATED JULY 15, 1994	
					FROM ANTON PINISCALLI TO JEANE S. NIKON	

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BENCH MARKS

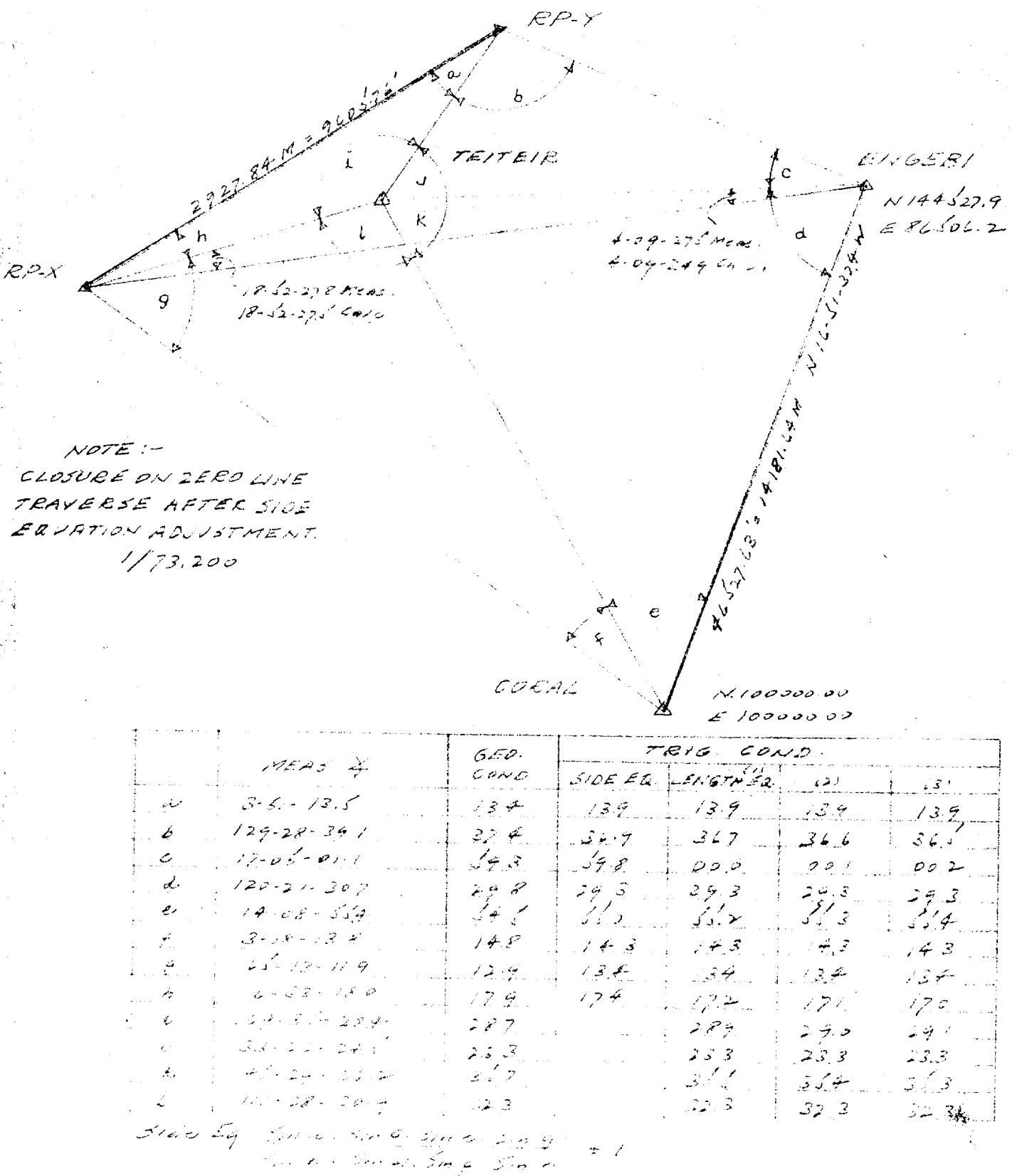
STATION	ELEV.	FILED	PAGE	DATE	DESCRIPTION	REMARKS	TIDE OBSERVATIONS			
							C.C. FROM TRAVERSE RUNIT ALSO CALLED RUNIT	C.C. FROM RUNIT	C.C. FROM RUNIT	
V. VONNE TRAVERSE RUNIT SOUTH BASE	12.95	5	2	3-16-49	U.S.C. & G.S. MON.					
ZONA	TOWER FTGS WINCH BASE	6.67 6.64	134 73	15 20	11-29-50 11-29-50	NOT AVAILABLE NOT AVAILABLE				
ALVIN										
BRUCE	ANIAANII BESS BYRL	9.60 8.70 9.07	165 165 18	24 4-19-52 4-19-52						
CYDDE										
DAVID	PIER BLDG. 48	9.00 10.17	85 32	12 3	12-9-50 3-14-50	PILE CUTOFF - BASE OF PIER BOOSTER PUMP STATION	FROM M.H. INVERT GRADES NO SOURCE GIVEN			
ELMER	ASH PARRY MAGNETIC "H" "L" "M" P.I. #25 P.I. #26	9.86 8.63 12.2 13.24 11.07 17.97 10.84 9.77	78 P.S. 578 P.S. 578 P.S. 578 P.S. 578 P.S. 578 P.S. 578 P.S. 578				STANDARD H&N DISC IN CONC. STANDARD H&N DISC IN CONC.			
FRED	ENTIWET "A" ENTIWET "B" ENTIWET "C" B.M. #4 B.M. #6 B.M. #7	15.03 10.83 13.85 12.02 10.27 11.65	LIST OF VALID BENCHES LIST OF VALID BENCHES				USC & GS MON. 220, N OF NE COR. USC & GS MON. NO. BLDG. 117A & B USC & GS MON. ACCR. RD PR BLDG. A CONC. MON. 93, SW USC & GS #2 CONC. MON. NO. SIDE CHAPEL DOMC. PYRAMID ACROSS FR WOODS FIELD	AIRSTRIP		
	B.M. 53-A B.M. 53-B B.M. 53-C B.M. 53-D B.M. 53-E B.M. 53-H B.M. 53-I	10.87 11.17 12.33 13.82 11.32 19.84 17.21	LIST OF VALID BENCHES LIST OF VALID BENCHES				N.W. COR. SLAB BLDG. #7 N.E. COR. DOOR SLAB BLDG. #15 N.E. COR. SLAB BLDG. #50 TOP FIRE HYD. OPP. WHSE #37 S.W. COR. CENTER SLAB BLDG. #56 TOP FIRE HYD. #16 OPP. BLDG. #160 TOP FIRE HYD. #17 83' N. OPP. BLDG. #156	DECLASSIFIED PER DOE LETTER DATED JULY, 15, 1994 FROM ATTON SINISGALLI TO DIANE S. NIXON		
YEROT	RIGILLI	9.11	159	4	2-21-52	50 Cal shell in Cone Mon	OFFICIAL USE ONLY	SECRET	SECRET	

PLANE COORDINATES - IVY GRID 1952 EXPANSION OF HORIZONTAL CONTROL							
LOCATION RP-X, RP-Y, Teller		JOB NO. 831					
SUCCESSIONS	TRaverse COMPUTATIONS	COORDINATES					
		DEPARTURE	ARRIVAL	LATITUDE	SINE	COSINE	COUSE AND DISTANCE
1	Corl.	N 26-51-31.00	W 6527.53	95.0236	.29001711	.4527.96	EAST
2	Engoy	N 59-52-22.19	11345.19	850.9721	.5792.55	.8001.78	WEST
3	R. Y.	S 70-51-17.56	9605.96	1227.0739	.9603.36	.3263.48	NORTH
4	R. Y.	S 11-51-21.17	5629.26	5636.965	.3524.63	.9229.62	SOUTH
5	Corl.	S 11-51-21.17	5629.26	5636.965	.3524.63	.9229.62	100,000.00
6							
7							
8	Engoy	N 76-51-31.76	11547.47	22343975	9737313	3722.60	114,521.94
9	Rection	S 01-28-4.56	3513.35	10560164	90619303	15506.896	86,506.18
10	R. Y.-X					3524.210	148,250.57
11							70,999.28
12	Tell. X	N 7-31-20.60	6402.29	3111635	24104630	5105.44	67,475.07
13	R. Y.						
14							
15	Engoy	N 26-51-31.01	16233101	96.073636	3130.67	114,527.94	114,527.94
16	R. Y.-X					144,654.797	67,475.12
17							
18	Corl.	N 31-23-27.86	5605.23	85705768	5155360	149250.56	149,390.00
19	Teller						100,000.00
20							70,993.28
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							

BY A.R.B. DATE 7-2-52
CHKD. BY R.P. DATE.

SUBJECT TELEGRAPHIC PLANIMETRY
1952 EXPLANATION

SHEET NO. 1 OF 3
JOB NO. 831
TEITEIR, RP-X, RP-Y



Log. Sum = 9.831422.3 302. Log. Sum = 9.887649.4 173
a 9.831991.2 165 b 9.95191.2 164
c 9.383 1.23 22.5 d 8.560 1.7 32.1
e 9.76803.8 2.7 f 9.570 0.9 18.5
f 9.201 1.2 22.7 g 9.301 1.2 32.0
g 9.1051.7 0.58" h 9.320 1.2 32.0
h 9.34 1.2 32.0

BY A.R.B. DATE 7-2-58
CHKD. BY L.S.H. DATE 10-17-58

SUBJECT TRIANGULATION ADJ.
1952 EXPANSION

SHEET NO. 2 OF 3
JOB NO. 831
TEITEIR RODX-RPY

Length Eq. 14181.24 Sin 2 Sin 5 Sin 2 = 1
2927.84 Sin 2 Sin 6 Sin 6

(1)

	41517268			3.4665472
Log Sin 2	9.3881683	83.6	Log Sin 6	9.8531918 207
C	9.4679947	68.6	C	9.8871503 173
i	9.2568822	116.6	i	9.0574912 183.1
	22647720	266.8		22647813 221.1
				7224 266.8
				50 487.9

$$901487.9 = 0.18''$$

<u>46527.60</u>	Sin 14-08-15.2	Sin 120-21-29.2
Sin 45-29-35.4	15447.42	56295.22
<u>15942.82</u>	Sin 17-05-00.0	Sin 33-26-23.3
Sin 129-28-36.7	10269.25	11385.16
<u>6069.25</u>	Sin 169-36-28.9	Sin 3-31-13.9
Sin 6-33-17.2	9605.66	3573.56
<u>56295.23</u>	Sin 3-18-14.3	Sin 111-28-32.3
Sin 25-13-13.6	3573.56	37699.42
	9605.66 = 9605.76 Meas.	

(2)

	41517268		3.4665472
Log Sin 2	9.3881700	83.6	9.8521413 207
C	9.4679950	68.6	9.8871502 173
i	9.2568799	116.6	9.0574876 183.1
	22647727	266.8	22647727 221.1
			7224 266.8
			50 487.9

$$411487.9 = 0.09 \text{ ft } 0.10$$

<u>46527.60</u>	Sin 14-08-15.3	Sin 120-21-29.3
Sin 45-29-35.4	15447.42	56295.22
<u>15942.82</u>	Sin 17-05-00.1	Sin 33-26-23.3
Sin 129-28-36.6	10269.27	11385.16
<u>6069.27</u>	Sin 169-36-29.0	Sin 3-31-13.9
Sin 6-33-17.1	9605.67	3573.57
<u>56295.22</u>	Sin 3-18-14.3	Sin 111-28-32.3
Sin 25-13-13.6	3573.56	37699.40

$$9001747 = 9605.76 \text{ Meas.}$$

BY A.R.B. DATE 7-2-52
CHKD. BY L.S.H. DATE 10-1-52

SUBJECT TRIANGULATION ADJ.
19'2 EXPANDED

SHEET NO. 3 OF 3
JOB NO. 831
TELETYPE, E.P.X., R.P.Y.

(3)

	41317268	3.4665477
Log 5104	93681708	98531911
0	9.4677967	9.8875508
i	92568788	9.0574858
	23647731	2.2647754
		31
		266.8
	2314579 = 0.067 ($\pm 0.10^m$)	23
		4879

46527.63
SIN 45-29-352

SIN 14-08-514
15947.47

SIN 120-21-293
56295.20

12947.42
SIN 129-08-365

SIN 17-25-03.2
6069.29

SIN 23-26-233
11385.14

6069.29
SIN 6-25-17.0

SIN 169-35-231
7605.76

SIN 3-15-13.4
2573.23

5624528
SIN 6-18-13.4

SIN 3-18-14.3
3573.16

SIN 111-28-22.3
57699.47

9625.76 Calc. = 9605.76 Meas.

COMPUTATION OF TRIANGLES

COMPUTED BY	L.S.H.	CHECKED BY	L.S.H.	DATE	Oct. 1952	
STATION	OBSERVED ANGLE	CORR-N	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3						
1 Teiteir	45-29-36.2	- 0.8	35.4	0.1	35.3	4.1517265
2 Engebi	120-21-30.7	- 1.3	29.4	0.1	29.3	0.1468091
3 Coral	14-08-55.4	0.0	55.4	0.0	55.4	9.9359520
I-3	02.3				17158.83	9.3881717
I-2					4860.79	4.2344876
						3.6867073
2-3						
1 RP-Y	129-26-39.1	- 2.6	36.5	0.0	36.5	3.6867073
2 Engebi	17-05-01.1	- 0.9	00.2	0.0	00.2	0.1124491
3 Teiteir	38-26-24.5	- 1.2	23.3	0.0	23.3	9.4679974
I-3	04.7				1849.92	9.7411994
I-2					3470.21	3.2671538
						3.5403558
2-3						
1 RP-X	6-33-18.0	- 1.0	17.0	0.0	17.0	3.2671538
2 RP-Y	3-51-13.5	+ 0.4	13.9	0.0	13.9	0.9425161
3 Teiteir	169-35-28.4	+ 0.7	29.1	0.0	29.1	8.8274459
I-3	59.9				1089.22	9.2568777
I-2					2927.84	3.0371158
						3.4665476
2-3						
1 RP-X	65-13-11.9	+ 1.5	13.4	0.0	13.4	4.2344876
2 Teiteir	111-28-30.9	+ 1.4	32.3	0.0	32.3	0.0419492
3 Coral	3-18-13.8	+ 0.5	14.3	0.0	14.3	9.9687506
I-3	56.6				17586.82	8.7606731
I-2					1089.21	4.2451874
						3.0371099

POSITION COMPUTATION

HOLMES & HARVER, INC.
ENGINEERS-CONSTRUCTORS

४६

JOB NO. 1

Reproduced from the holdings of the N.Y. : : -

COMPUTED BY		L.S.H.		DATE		Nov. 1952	
2	Engels	103	Corral	102	Engels	103	Corral
3	Engels	104	Tettar	101	Tettar	104	Engels
4	Engels	105	Engels	106	Engels	105	Engels
5	Engels	106	Engels	107	Engels	106	Engels
6	Engels	108	Engels	109	Engels	108	Engels
7	Engels	110	Engels	111	Engels	110	Engels
8	Engels	112	Engels	113	Engels	112	Engels
9	Engels	114	Engels	115	Engels	114	Engels
10	Engels	116	Engels	117	Engels	116	Engels
11	Engels	118	Engels	119	Engels	118	Engels
12	Engels	120	Engels	121	Engels	120	Engels
13	Engels	122	Engels	123	Engels	122	Engels
14	Engels	124	Engels	125	Engels	124	Engels
15	Engels	126	Engels	127	Engels	126	Engels
16	Engels	128	Engels	129	Engels	128	Engels
17	Engels	130	Engels	131	Engels	130	Engels
18	Engels	132	Engels	133	Engels	132	Engels
19	Engels	134	Engels	135	Engels	134	Engels
20	Engels	136	Engels	137	Engels	136	Engels
21	Engels	138	Engels	139	Engels	138	Engels
22	Engels	140	Engels	141	Engels	140	Engels
23	Engels	142	Engels	143	Engels	142	Engels
24	Engels	144	Engels	145	Engels	144	Engels
25	Engels	146	Engels	147	Engels	146	Engels
26	Engels	148	Engels	149	Engels	148	Engels
27	Engels	150	Engels	151	Engels	150	Engels
28	Engels	152	Engels	153	Engels	152	Engels
29	Engels	154	Engels	155	Engels	154	Engels
30	Engels	156	Engels	157	Engels	156	Engels
31	Engels	158	Engels	159	Engels	158	Engels
32	Engels	160	Engels	161	Engels	160	Engels
33	Engels	162	Engels	163	Engels	162	Engels
34	Engels	164	Engels	165	Engels	164	Engels
35	Engels	166	Engels	167	Engels	166	Engels
36	Engels	168	Engels	169	Engels	168	Engels
37	Engels	170	Engels	171	Engels	170	Engels
38	Engels	172	Engels	173	Engels	172	Engels
39	Engels	174	Engels	175	Engels	174	Engels
40	Engels	176	Engels	177	Engels	176	Engels
41	Engels	178	Engels	179	Engels	178	Engels
42	Engels	180	Engels	181	Engels	180	Engels
43	Engels	182	Engels	183	Engels	182	Engels
44	Engels	184	Engels	185	Engels	184	Engels
45	Engels	186	Engels	187	Engels	186	Engels
46	Engels	188	Engels	189	Engels	188	Engels
47	Engels	190	Engels	191	Engels	190	Engels
48	Engels	192	Engels	193	Engels	192	Engels
49	Engels	194	Engels	195	Engels	194	Engels
50	Engels	196	Engels	197	Engels	196	Engels
51	Engels	198	Engels	199	Engels	198	Engels
52	Engels	200	Engels	201	Engels	200	Engels
53	Engels	202	Engels	203	Engels	202	Engels
54	Engels	204	Engels	205	Engels	204	Engels
55	Engels	206	Engels	207	Engels	206	Engels
56	Engels	208	Engels	209	Engels	208	Engels
57	Engels	210	Engels	211	Engels	210	Engels
58	Engels	212	Engels	213	Engels	212	Engels
59	Engels	214	Engels	215	Engels	214	Engels
60	Engels	216	Engels	217	Engels	216	Engels
61	Engels	218	Engels	219	Engels	218	Engels
62	Engels	220	Engels	221	Engels	220	Engels
63	Engels	222	Engels	223	Engels	222	Engels
64	Engels	224	Engels	225	Engels	224	Engels
65	Engels	226	Engels	227	Engels	226	Engels
66	Engels	228	Engels	229	Engels	228	Engels
67	Engels	230	Engels	231	Engels	230	Engels
68	Engels	232	Engels	233	Engels	232	Engels
69	Engels	234	Engels	235	Engels	234	Engels
70	Engels	236	Engels	237	Engels	236	Engels
71	Engels	238	Engels	239	Engels	238	Engels
72	Engels	240	Engels	241	Engels	240	Engels
73	Engels	242	Engels	243	Engels	242	Engels
74	Engels	244	Engels	245	Engels	244	Engels
75	Engels	246	Engels	247	Engels	246	Engels
76	Engels	248	Engels	249	Engels	248	Engels
77	Engels	250	Engels	251	Engels	250	Engels
78	Engels	252	Engels	253	Engels	252	Engels
79	Engels	254	Engels	255	Engels	254	Engels
80	Engels	256	Engels	257	Engels	256	Engels
81	Engels	258	Engels	259	Engels	258	Engels
82	Engels	260	Engels	261	Engels	260	Engels
83	Engels	262	Engels	263	Engels	262	Engels
84	Engels	264	Engels	265	Engels	264	Engels
85	Engels	266	Engels	267	Engels	266	Engels
86	Engels	268	Engels	269	Engels	268	Engels
87	Engels	270	Engels	271	Engels	270	Engels
88	Engels	272	Engels	273	Engels	272	Engels
89	Engels	274	Engels	275	Engels	274	Engels
90	Engels	276	Engels	277	Engels	276	Engels
91	Engels	278	Engels	279	Engels	278	Engels
92	Engels	280	Engels	281	Engels	280	Engels
93	Engels	282	Engels	283	Engels	282	Engels
94	Engels	284	Engels	285	Engels	284	Engels
95	Engels	286	Engels	287	Engels	286	Engels
96	Engels	288	Engels	289	Engels	288	Engels
97	Engels	290	Engels	291	Engels	290	Engels
98	Engels	292	Engels	293	Engels	292	Engels
99	Engels	294	Engels	295	Engels	294	Engels
100	Engels	296	Engels	297	Engels	296	Engels
101	Engels	298	Engels	299	Engels	298	Engels
102	Engels	300	Engels	301	Engels	300	Engels
103	Engels	302	Engels	303	Engels	302	Engels
104	Engels	304	Engels	305	Engels	304	Engels
105	Engels	306	Engels	307	Engels	306	Engels
106	Engels	308	Engels	309	Engels	308	Engels
107	Engels	310	Engels	311	Engels	310	Engels
108	Engels	312	Engels	313	Engels	312	Engels
109	Engels	314	Engels	315	Engels	314	Engels
110	Engels	316	Engels	317	Engels	316	Engels
111	Engels	318	Engels	319	Engels	318	Engels
112	Engels	320	Engels	321	Engels	320	Engels
113	Engels	322	Engels	323	Engels	322	Engels
114	Engels	324	Engels	325	Engels	324	Engels
115	Engels	326	Engels	327	Engels	326	Engels
116	Engels	328	Engels	329	Engels	328	Engels
117	Engels	330	Engels	331	Engels	330	Engels
118	Engels	332	Engels	333	Engels	332	Engels
119	Engels	334	Engels	335	Engels	334	Engels
120	Engels	336	Engels	337	Engels	336	Engels
121	Engels	338	Engels	339	Engels	338	Engels
122	Engels	340	Engels	341	Engels	340	Engels
123	Engels	342	Engels	343	Engels	342	Engels
124	Engels	344	Engels	345	Engels	344	Engels
125	Engels	346	Engels	347	Engels	346	Engels
126	Engels	348	Engels	349	Engels	348	Engels
127	Engels	350	Engels	351	Engels	350	Engels
128	Engels	352	Engels	353	Engels	352	Engels
129	Engels	354	Engels	355	Engels	354	Engels
130	Engels	356	Engels	357	Engels	356	Engels
131	Engels	358	Engels	359	Engels	358	Engels
132	Engels	360	Engels	361	Engels	360	Engels
133	Engels	362	Engels	363	Engels	362	Engels
134	Engels	364	Engels	365	Engels	364	Engels
135	Engels	366	Engels	367	Engels	366	Engels
136	Engels	368	Engels	369	Engels	368	Engels
137	Engels	370	Engels	371	Engels	370	Engels
138	Engels	372	Engels	373	Engels	372	Engels
139	Engels	374	Engels	375	Engels	374	Engels
140	Engels	376	Engels	377	Engels	376	Engels
141	Engels	378	Engels	379	Engels	378	Engels
142	Engels	380	Engels	381	Engels	380	Engels
143	Engels	382	Engels	383	Engels	382	Engels
144	Engels	384	Engels	385	Engels	384	Engels
145	Engels	386	Engels	387	Engels	386	Engels
146	Engels	388	Engels	389	Engels	388	Engels
147	Engels	390	Engels	391	Engels	390	Engels
148	Engels	392	Engels	393	Engels	392	Engels
149	Engels	394	Engels	395	Engels	394	Engels
150	Engels	396	Engels	397	Engels	396	Engels
151	Engels	398	Engels	399	Engels	398	Engels
152	Engels	400	Engels	401	Engels	400	Engels
153	Engels	402	Engels	403	Engels	402	Engels
154	Engels	404	Engels	405	Engels	404	Engels
155	Engels	406	Engels	407	Engels	406	Engels
156	Engels	408	Engels	409	Engels	408	Engels
157	Engels	410	Engels	411	Engels	410	Engels
158	Engels	412	Engels	413	Engels	412	Engels
159	Engels	414	Engels	415	Engels	414	Engels
160	Engels	416	Engels	417	Engels	416	Engels
161	Engels	418	Engels	419	Engels	418	Engels
162	Engels	420	Engels	421	Engels	420	Engels
163	Engels	422	Engels	423	Engels	422	Engels
164	Engels	424	Engels	425	Engels	424	Engels
165	Engels	426	Engels	427	Engels	426	Engels
166	Engels	428	Engels	429	Engels	428	Engels
167	Engels	430	Engels	431	Engels	430	Engels
168	Engels	432	Engels	433	Engels	432	Engels
169	Engels	434	Engels	435	Engels	434	Engels
170	Engels	436	Engels	437	Engels	436	Engels
171	Engels	438	Engels	439	Engels	438	Engels
172	Engels	440	Engels	441	Engels	440	Engels
173	Engels	442	Engels	443	Engels	442	Engels
174	Engels	444	Engels	445	Engels	444	Engels
175	Engels	446	Engels	447	Engels	446	Engels
176	Engels	448	Engels	449	Engels	448	Engels
177	Engels	450	Engels	451	Engels	450	Engels
178	Engels	452	Engels	453	Engels	452	Engels
179	Engels	454	Engels	455	Engels	454	Engels
180	Engels	456	Engels	457	Engels	456	Engels
181	Engels	458	Engels	459	Engels	458	Engels
182	Engels	460	Engels	461	Engels	460	Engels
183	Engels	462	Engels	463	Engels	462	Engels
184	Engels	464	Engels	465	Engels	464	Engels
185	Engels	466	Engels	467	Engels	466	Engels
186	Engels	468	Engels	469	Engels	468	Engels
187	Engels	470	Engels	471	Engels	470	Engels
188	Engels	472	Engels	473	Engels	472	Engels
189	Engels	474	Engels	475	Engels	474	Engels
190	Engels	476	Engels	477	Engels	476	Engels
191	Eng						

$\epsilon = 0.0$

HOLMES & MARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION

COMPUTED BY L.S.H. DATE Nov. 1952.

α'	2	Engebi	to 3 Teiteir	103	29	29.6	α	3 Teiteir	to 2 Engebi	283	28	58.0
$\Delta \alpha$	2	Engebi	to 3 Teiteir	8	05	00.2	$\Delta \alpha$	3 Teiteir	to 2 Engebi	- 33	26	23.3
α'	2	Engebi	to 1 RP-Y	120	34	29.8	α	3 Teiteir	to 1 RP-Y	250	02	34.7
$\Delta \alpha$	2	Engebi	to 1 RP-Y	-	20.0	$\Delta \alpha$	$\Delta \alpha$	$\Delta \alpha$	$\Delta \alpha$	+ 11.6		

FIRST ANGLE OF TRIANGLE 129-28-36.5

β	11	39	41.964	2 Engebi	162	14	55.151	ϕ	11	40	18.861	3 Teiteir
$\Delta \phi$	+	57.445			$\Delta \lambda$	-	1 38.649	$\Delta \phi$	+ 20.648		$\Delta \lambda$	
ϕ'	11	40	38.405	1 RP-Y	162	13	16.502	ϕ'	11	40	39.409	1 RP-Y
Logarithms					Logarithms					Logarithms		
$\frac{1}{2}(\phi + \phi')$	11	40	10.686	$\frac{1}{2}(\phi + \phi')$	11	40	10.686	$\frac{1}{2}(\phi + \phi')$	11	40	29.035	Logarithms Values in seconds
$\cos \alpha$	9.7034319			$\cos \alpha$	9.5331557			$\cos \alpha$	9.5331557			Logarithms Values in seconds
E	3.6124960			S	3.5403592			S	8.6124956			Sec ϕ
θ	1.7692850			A	8.5096365			A	1.3128066			$\sin^2 \alpha$
β^2	7.00071			$\sec \phi$	0.0090834			$\sec \phi$	6.53431			$\sin^2 \phi$
$\sin^2 \alpha$	9.86897			$\Delta \lambda$	1.9940943	98.6494	C	$\Delta \lambda$	0.72179			$\sin^2(\phi + \phi')$
G	0.72139			$\Delta \alpha$	1.3000222	19.954	$\Delta \alpha$	$\Delta \alpha$	7.20231			$\sin^2(\phi + \phi')$
H	7.66207			$\sin^2(\phi + \phi')$	9.3059279			$\Delta \alpha$	2.6256			$\sin^2(\phi + \phi')$
I	3.51936			$\Delta \alpha$	1.9892			$\Delta \alpha$	1.0651252			$\sin^2(\phi + \phi')$
J	1.98938			$\Delta \alpha$	4.6148			$\Delta \alpha$	1.1616			$\sin^2(\phi + \phi')$
K	5.6074			$\Delta \alpha$	- 57.4447			$\Delta \alpha$	- 20.6482			$\sin^2(\phi + \phi')$
L				$\Delta \alpha$				$\Delta \alpha$				$\sin^2(\phi + \phi')$

HORNES & HARVEY INC.
ENGINEERS & CONTRACTORS

TRAVERSE COMPUTATIONS

DATE

10-28-52

CALC. BY

LSB

CHECKED BY

LSB

PLANE COORDINATES - IVY GRID
1952 EXPANSION OF HORIZONTAL CONTROL

JOB NO. 851 LOCATION RAIL #2 Bore #2

STATION	COURSE	DISTANCE	COSINE	SINE	LATITUDE	DEPARTURE			COORDINATES
						EAST	WEST	NORTH	
1									
2	Biwetok	N 69-03-08.8W	.98575-.78	.56765-1.327	.93530-006	35242-149		92060-716	35618-29
3	R1611 #2	N 17-04-57.0E	.70167-.57	.95538-0278	.29374-038	67071-781		71860-44	32180-04
4	Bogs #2	N 80-54-24.7E	.24166-.00	.16378-117	.98649-0659	6595-747		138932-22	52201-59
5	Bogebi							144627-97	(.94)
6								86506-25	(.16)
7									5
8									6
9									7
10	Coral	S 67-27-45.6W	.73416-.86	.36528-054	.92362-099	28139-006		100000.00	10
11	R1611 #2							71860-59	(.44)
12								32169-99	(.04)
13									11
14	Coral	N 50-28-55.6W	.61183-.40	.63635-911	.77142-056	38932-167		100000.00	12
15	Bogs #2							158932-17	(.22)
16								52801-54	(.59)
17									13
18									14
19									15
20									16
21									17
22									18
23									19
24									20
25									21
26									22
27									23
28									24
29									25
30									26

BY A.R.B. DATE May 1962
CHKD. BY L.H. DATE Nov 1962

SUBJECT TOWER AND ELEVATOR AREA
1962 Surveyed and Checked

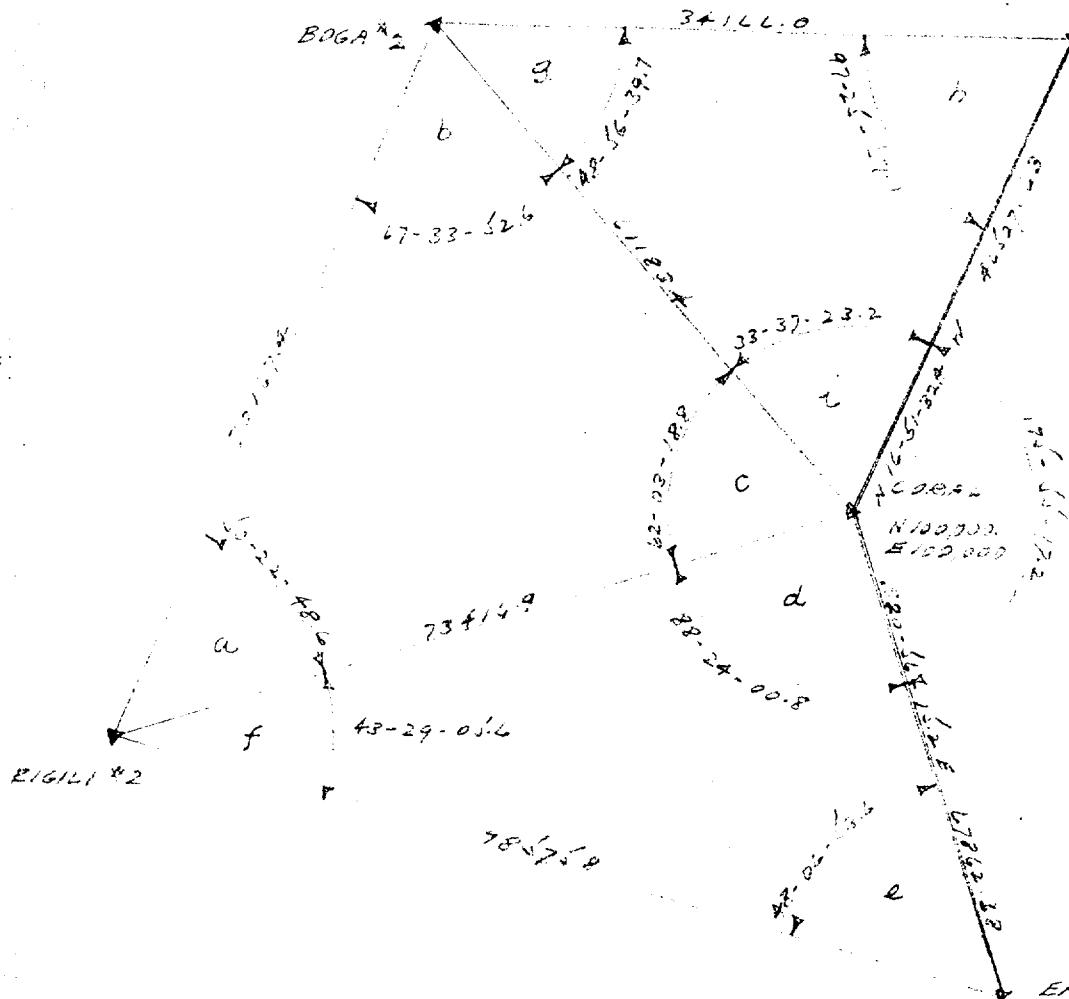
SHEET NO. 1 OF 2

JOB NO. 831

BOGA #2 - RIGID

ENGEPI

N 144° 27.94'
E 86° 06.18'



ENGEPI
N 36° 18.29'
E 124° 25.75'

285.4		GEO. COND.		TRIG. COND.	
a	53-22-52.8	180° FOR A	b+c+d=428	11	23
b	67-33-53.1	50.9	53.2	48.8	48.2
c	22-03-19.5	51.7	51.0	52.4	52.6
	05.6	17.4	18.8	18.8	18.8
d	88-24-00.8	59.4	00.8	00.8	00.8
e	48-02-17.4	55.9	53.2	53.8	53.8
f	48-29-06.1	04.7	04.0	05.4	05.6
	24.3				
g	48-56-20.9	42.1	41.8	39.9	39.7
h	77-26-16.3	56.2	53.6	53.9	53.1
i	23-07-21.3	21.7	23.2	23.2	23.2
	59.4				

CORR - Survey N 16-51-32.4 N

CORR - Survey S 20-52-07.3 E

54-55-34.9

54-56-25.1

+ 30-06-52.1

125-11-17.2 188-02-02.0

BY A.R.B. DATE July 1952 SUBJECT TRIANGULATION ADV.
CHKD. BY E.L.H. DATE Nov. 1952 1912 EXPANSION

SHEET NO. 2 OF 2
JOB NO. 231
B.O.G.R. #2 - E1611

Trig Con'd (Engines - Corral) (Sims & Sims a. Dist.)
(Engines - Corral) (Sims a. Dist.)

(1) Log 14181-64 4.15172-68	Log 20684-59 4.31564-69
" Sim a 9.97673-68 02.9	" Sim a 9.87105-69 18.9
" " b 9.9618-68 08.7	" " a 9.82166-68 17.4
" " f 9.87269-68 22.2	" " g 9.82241-68 18.3
3.95157-68 33.6	3.95158-68 34.6
	63.2 33.6
130/188.2 = 147"	130 282

67862-68	Sim 48-03-13-8	Sim 88-24-00-8
Sim 48-29-05-6	(73416.81)	(98575.82)
46527-63	Sim 47-25-52-8	Sim 33-27-23-2
Sim 48-16-39-9	(61183.86)	(34166.97)
61183 3594	Sim 47-33-52-8	Sim 62-03-18-8
Sim 48-22-48-8	(73416.72)	(70167.26)

(2) Log 14181-64 4.15172-68	Log 20684-59 4.31564-69
" Sim a 9.97673-68 02.9	" Sim a 9.87185-69 18.9
" " b 9.96181-68 08.7	" " a 9.82166-69 17.4
" " f 9.87269-68 22.2	" " g 9.82241-68 18.3
3.95157-68 33.6	3.95157-68 34.6
	219. 33.6
15188.2 = 0.17"	15 28.2

67862-68	Sim 48-03-13-8	Sim 88-24-00-8
Sim 48-29-05-6	(73416.81)	(98575.82)
46527-63	Sim 47-25-52-8	Sim 33-27-23-2
Sim 48-16-39-9	(61183.86)	(34166.00)
61183 4030	Sim 47-33-52-8	Sim 62-03-18-8
Sim 48-22-48-8	(73416.86)	(70167.37)

Corral - Eng 11, #2 73416.9

COMPUTATION OF TRIANGLES

COMPUTED BY L.S.H. CHECKED BY L.S.H. DATE Oct. 1952

STATION	OBSERVED ANGLE	CORR-N	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3						4.1517265
1 Boga #2	48-56-41.9	- 2.0	39.9	0.2	39.7	0.1228871
2 Engebi	97-25-56.0	+ 1.3	57.3	0.2	57.1	9.9963356
3 Coral	88-37-21.5	+ 1.7	23.2	0.0	23.2	9.7432960
I-3	59.4				18648.73	4.2706492
I-2					10413.81	4.0176096
2-3						4.2706492
1 Rigili #2	50-22-52.8	- 3.8	49.0	0.4	48.6	0.1133443
2 Boga #2	67-33-53.5	- 0.4	53.1	0.5	52.6	9.9658179
3 Coral	62-03-19.3	- 0.5	18.8	0.0	18.8	9.9461673
I-3	05.6				22377.49	4.3498114
I-2					21387.04	4.3301508
2-3						4.3156469
1 Rigili #2	43-29-06.1	+ 0.1	06.2	0.6	05.6	0.1623085
2 Coral	88-24-00.8	0.0	00.8	0.0	00.8	9.9998307
3 Eniwetok	48-06-57.4	- 3.2	54.2	0.6	53.6	9.8718560
I-3	04.3				30045.96	4.4777861
I-2					22377.49	4.3498114
2-3						
I						
2						
3						
I-3						
I-2						

$\epsilon = 0.4$

HOLMES & MARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMPUTED BY L.S.H.	DATE Nov. 1852
2 Engebi	3 Coral
+ 97	- 25
11 Engebi	101 Boga #2
-	- 1
10 Boga #2	11 Engebi
-	- 32
11 39 41.3642	11 39 41.3642
-	- 55.610
11 38 46.3542	11 38 46.3542
-	- 55.5541
1.7447159	1st term + 55.5541
8.03522	8.03522
5.98817	5.98817
0.72204	2.6303970 + 339.1541
8.74543	2 d term + 0.0556 Sin ² (φ+φ') 9.3053512
3.4694	-Δφ 1.8357482 + 68.6509
1.9384	7.1581 3d term + 0.00000
6.4733	-Δφ' + 55.6097

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	33

$\epsilon = 0.9$

HOLMES & MARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMPUTED BY I.S.H. DATE Nov. 1952

α'	2	Boga #2	to 3	Coral	309	29	28.0	3	Corel	to 2	Boga #2	129	31	04.4
$\Delta \alpha'$					+ 67	33	53.1	3d/2				- 62	03	18.8
α'														
$\Delta \alpha'$														

α'	1	Rigilli #2	to 2	Boga #2	197	02	40.6	α'	Rigilli #2	to 3	Corel	247	25	29.6
$\Delta \alpha'$														
α'														
$\Delta \alpha'$														

FIRST ANGLE TRIANGLE 50-22-49.0

α'	11	38	46.356	2	Boga #2	162	09	15.997	ϕ	11	32	20.254	3	Coral
$\Delta \alpha'$	- 11	05.472			$\Delta \lambda$	-	3	26.962	$\Delta \phi$	-	4	39.371		
α'	11	27	40.883	1	Rigilli #2	162	05	49.035	ϕ	11	27	40.883	1	Rigilli #2
$\Delta \alpha'$														

Logarithms / Logarithms in seconds

$\frac{1}{2}(\phi + \phi')$	11	33	13.619	5	4.3498120									
$\log \sin \alpha$					Logarithms in seconds									
$\log \cos \alpha$					Logarithms in seconds									
$\log \sin \alpha'$					Logarithms in seconds									
$\log \cos \alpha'$					Logarithms in seconds									
$\log \sin \alpha$	4.3301513					4.3301513								
$\log \cos \alpha$	9.4673248						9.4673248							
$\log \sin \alpha'$	8.0087478							8.0087478						
$\log \cos \alpha'$	8.5096667								8.5096667					
$\log \sin \alpha$	2.3158906								2.3158906					
$\log \cos \alpha$	9.3016543									9.3016543				
$\log \sin \alpha$	1.6175449									1.6175449				
$\log \cos \alpha$	41.452										41.452			
$\log \sin \alpha$	0.02075										0.02075			
$\log \cos \alpha$	9.2996612											9.2996612		
$\log \sin \alpha$	2.1333869											2.1333869		
$\log \cos \alpha$	4.724												4.724	
$\log \sin \alpha$	0.0043												0.0043	
$\log \cos \alpha$	6.665												6.665	
$\log \sin \alpha$	279.3710													279.3710
$\log \cos \alpha$	0.0008													

$\epsilon = 2.2$

JOB No 831

HOLMES & MARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION

COMPUTED BY L.S.H. DATE Nov. 1952

SECOND ORDER TRIANGULATION

α	2 Coral	to 3 Eniwetok	339	03	44.8	α	3 Eniwetok	to 2 Coral	159	04	33.2
$\Delta \alpha$	8	+	88	24	00.8	$\Delta \alpha$	8	-	48	06	54.2
α	2 Coral	to 1 Rigilli #2	67	27	45.6	α	3 Eniwetok	to 1 Rigilli #2	110	57	39.0
$\Delta \alpha$	-	-	2	16.0	$\Delta \alpha$	-	-	-	3	03.2	
α'	Rigilli #2	to 2 Coral	247	25	29.6	α'	Rigilli #2	to 3 Eniwetok	180	00	00.0
α'	Rigilli #2	to 3 Eniwetok	290	54	36.8						
FIRST ANGLE OF TRIANGLE 43 - 29 - 06.2											
ϕ	11 32 20.254 2 Coral	λ	162 17 10.944	ϕ	11	21	51.469 3 Eniwetok	λ	162 21	14.730	"
$\Delta \phi$	- 4 39.371	$\Delta \lambda$	- 11 21.908	$\Delta \phi$	+ 5	49.416	$\Delta \lambda$	-	15	25.697	
ϕ'	11 27 40.883 1 Rigilli #2	λ'	162 05 49.036	ϕ'	11	27	40.885 2 Rigilli #2	λ'	162 05	49.036	"
Logarithms Values in seconds											
s	4.3498120	$\frac{1}{2}(\phi + \phi')$	11 30 00.569	s	4.4777861	s	$\frac{1}{2}(\phi + \phi')$	11 24	46.177		
$\cos \alpha$	9.5835223	Logarithms	Values in seconds	$\cos \alpha$	9.5535550	$\cos \alpha$	Logarithms	Values in seconds			
b	8.5124997			b	8.5125050	b					
n	2.4458340	1st term	+279.1477	$\sin \alpha$	9.9654980	n	2.5438461	1st term	-349.8212	$\sin \alpha$	4.4777861
β^2	8.59962	A'	8.5096677	s^2	8.95567	n				A'	9.9702656
$\sin^2 \alpha$	9.93100	$\sec \phi'$	0.0087478	$\sin^2 \alpha$	9.94053	$\sin^2 \alpha$	$\sec \phi'$	0.0087478		$\sec \phi'$	8.5096695
c	0.71669	$\Delta \lambda$	2.8337265	c	0.70988	c	$\Delta \lambda$	2.9664690	+925.6974		
d	9.34731	2d term	+ 0.2226 $\sin \frac{1}{2}(\phi + \phi')$	d	9.60598	d	$\Delta \alpha$	2.2628638	+183.174		
e	4.8917		9.2996612	d	1.9782	d	$\Delta \alpha$	2.2628638	+0.0012		
f	1.9845	3d term	+ 0.0008	e	7.0659	e	$\Delta \phi$	+279.3710	-349.4164		
g	6.8762			g		g					

HOLMES & NAMER, INC.
ENGINEERS-CONSTRUCTORS

TRAVERSE COMPUTATIONS

PLANE COORDINATES - IVY GRID
1952 EXPANSION OF HORIZONTAL CONTROL

CALC BY ISH

CHECKED BY

DATE 10-28-52

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Geodetic Survey Region

STATION	COURSE	DISTANCE	SINE		LATITUDE		DEPARTURE		COORDINATE S	COORDINATE E
			NORTH	SOUTH	EAST	WEST	NORTH	SOUTH		
1 Corral	S 70-57-07.38	37438.21	32635970	84624665	12216.323	36588.305	100000.00	100000.00	1	
2 Sand	S 4-45-44.1W	35369.70	99654778	08302127	3524-.600	2936.457	87781.68	136388.81	2	
3 Ivy	S 27-15-40.4W	17904.49	88892744	45304635	15915.792	8201.116	62634.08	132461.87	3	
4 Eniwetok	S 20-56-15.2W	67862.68	93597044	3675627	63381.737	24250.747	36618.28	124250.78	4	
5 Corral						100000.02	100000.00	100000.00	5	
6									6	
7									7	
8 Corral	S 34-21-35.7E	67459.05	82560654	66438965	47465.557	32451.868	100000.00	100000.00	8	
9 Ivy							62634.04	132461.87	9	
10									10	
11									11	
12 Sand							87781.68	136388.81	12	
13 Eniwetok	S 12-16-51.3W	52361.65	97711647	21270495	61165.453	11187.582	36618.25	124250.78	13	
14									14	
15									15	
16									16	
17									17	
18									18	
19									19	
20									20	
21									21	
22									22	
23									23	
24									24	
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29									29	
30									30	

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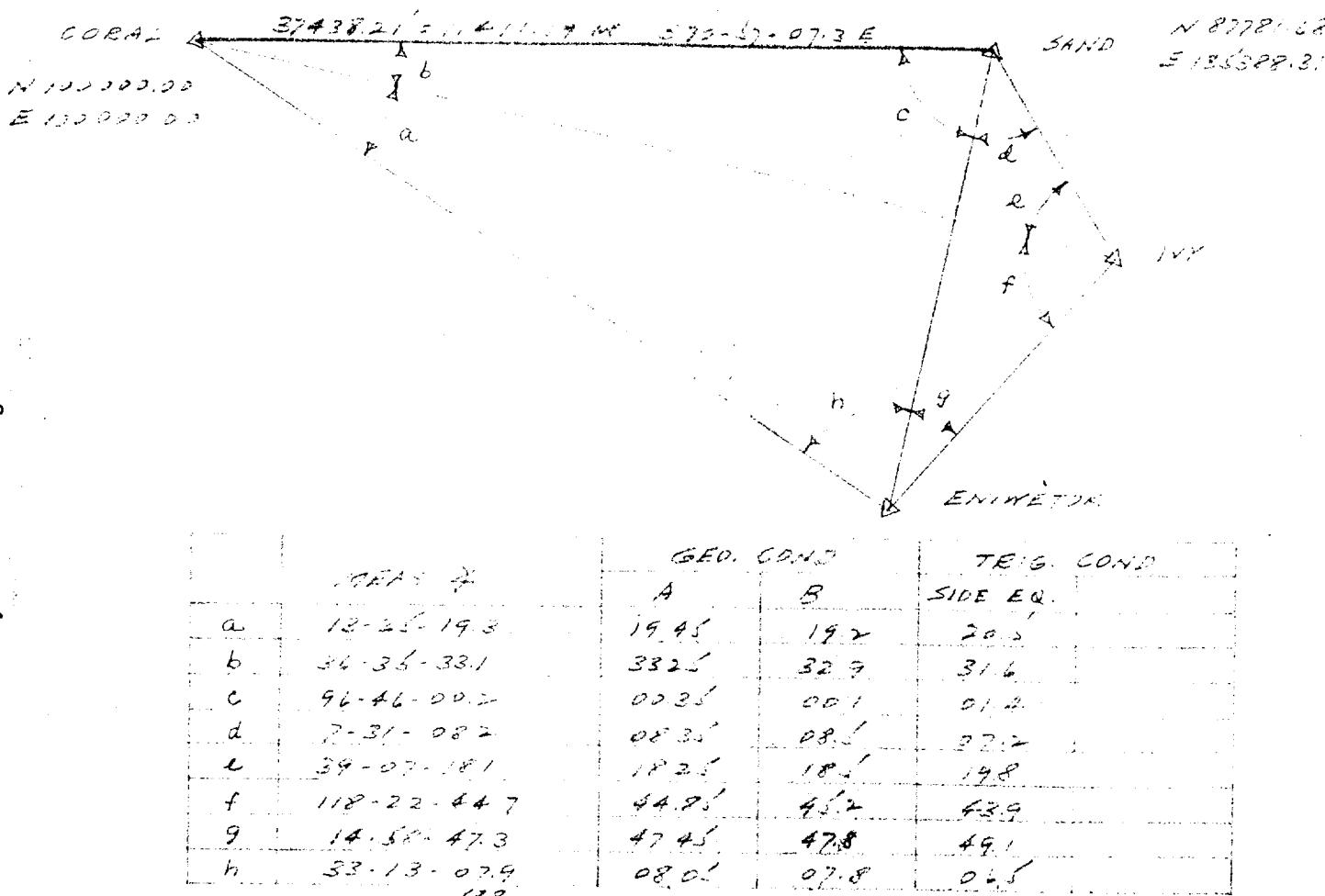
Geodetic Survey Region

351

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Pacific Southwest Region

BY L.S.H. DATE 10-14-52 SUBJECT TRIANGULATION AREA
CHKD. BY L.S.H. DATE 1952 EXPANSION

SHEET NO. 1 OF 1
JOB NO. 281



$$\text{Euler Equations} = \frac{\sin a \cdot \sin b \cdot \sin c \cdot \sin g}{\sin d \cdot \sin e \cdot \sin f \cdot \sin h} = 1$$

Log. 5100.	a	9.3657132	88.2	b	9.39510.0	9.3213333	28.4
c	9.394.9642	02.5	d	9.1167418	16.4		
e	9.000009.1	25.9	f	9.9443943	11.4		
g	9.4124085	28.7	h	9.7856524	32.4		
	8.5751154	19.3	i	9.2751718	23.4		
					11.54	19.53	
					10.00	42.00	
564-1426.7	=	1.32"					

55-4382.21	55-30-00-121	55-42-02-014
55-33-13-026	52-33-00-1	55-32-02-008
52-36-00-1	55-31-07-2	55-36-02-009
55-37-30-037	17904.5	55-36-02-008
55-38-00-1	55-32-07-082	55-36-02-008
55-39-00-028	55-32-09-05	55-36-02-008
57884.05	55-32-07-201	55-32-02-008
55-48-12-026	17904.49	55-32-02-007

Coral-Emmett, 31269.68

COMPUTATION OF TRIANGLES

COMPUTED BY	L.S.H.	CHECKED BY	L.S.H.	DATE		
STATION	OBSERVED ANGLE	CORR-N	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3						
1 Eniwetok	33-13-07.9	- 1.2	06.7	0.2	06.5	4.0573309
2 Coral	50-00-52.4	- 0.2	52.2	0.1	52.1	0.2613518
3 Sand	96-46-00.2	+ 1.4	01.6	0.2	01.4	9.8843460
I-3	00.5				15959.85	4.2030287
I-2					20684.58	4.3156466
2-3						
1 Ivy	39-07-18.1	+ 1.8	19.9	0.1	19.8	4.0573309
2 Coral	36-35-33.1	- 1.5	31.6	0.0	31.6	0.1999871
3 Sand	104-17-08.4	+ 0.4	08.8	0.2	08.6	9.7753296
I-3	59.6				10780.72	4.0326476
I-2					17525.74	4.2436764
2-3						
1 Eniwetok	48-11-55.2	+ 0.5	55.7	0.1	55.6	4.2436764
2 Coral	13-25-19.3	+ 1.2	20.5	0.0	20.5	0.1275747
3 Ivy	118-22-44.7	- 0.7	44.0	0.1	43.9	9.3657267
I-3	59.2				5457.30	9.9443958
I-2					20684.59	3.7369777
2-3						
1 Ivy	157-30-02.8	+ 0.9	03.7	0.0	03.7	4.2030287
2 Eniwetok	14-58-47.3	+ 1.8	49.1	0.0	49.1	0.4171792
3 Sand	7-31-08.2	- 1.0	07.2	0.0	07.2	9.4124387
I-3	58.3				10780.69	9.1167711
I-2					5457.31	4.0326466
						3.7369790

$\epsilon = 0.2$

HOLMES & MARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION

COMPUTED BY L.S.H. DATE Nov. 1952.

α	2	Coral	to 3	Ivy	325	38	24.3	α	3	Ivy	to 2	Coral	145	39	29.2
$\Delta \alpha$	\angle				+ 13	25	20.5	$\Delta \alpha$					- 118	22	44.0
α		Coral	to 1	Eniwetok	339	03	44.8	α		Ivy	to 1	Eniwetok	27	16	45.2
$\Delta \alpha$					+ 48.4		$\Delta \alpha$					-	16.2		28.9

α	1	Eniwetok	to 2	Coral	159	04	33.2	α	1	Eniwetok	to 3	Ivy	180	66	30.0
$\Delta \alpha$	\angle				+ 19.0		$\Delta \alpha$						207	16	28.9
α							α								
$\Delta \alpha$															

α	1	Eniwetok	to 2	Coral	159	04	33.2	α	1	Eniwetok	to 3	Ivy	180	66	30.0
$\Delta \alpha$	\angle				+ 19.0		$\Delta \alpha$						207	16	28.9
α							α								
$\Delta \alpha$															

四

POSITION COMPUTATION

COMPUTED BY L.S.H. DATE Nov. 1952.

HOLMES & MARVER, INC.
ENGINEERS-CONSTRUCTORS

SECOND ORDER TRIANGULATION

COMPUTED BY L.S.H. DATE NOV. 1962.

Ivy Coral 145 39 29.
FIRE-TRAIL & CREEK OF TRIANGLE 39-07-19.9

HOLMES & WARREN, INC.
ENGINEERS - CONTRACTORS

TRAVERSE COMPUTATIONS

CALC BY ABB

DATE 10-28-52

	STATION	COURSE	DISTANCE	COSINI
1	Coral	S 89-10-26.08	28900.6	0144178
2	Rundt	N 29-32-16.97	25008.04	8700286
3	Pilrai	S 41-50-50.77	26312.71	7449211
4	Coral			
5				
6				
7	Coral	E 75-01-26.38	24589.12	2684148
8	N. Base #3	S 37-13-21.08	8603.00	7922922
9	Rundt			
10				
11				
12	Pilrai	S 25-04-46.78	14625.66	9057211
13	N. Base #3			

Academic Southwestern Region

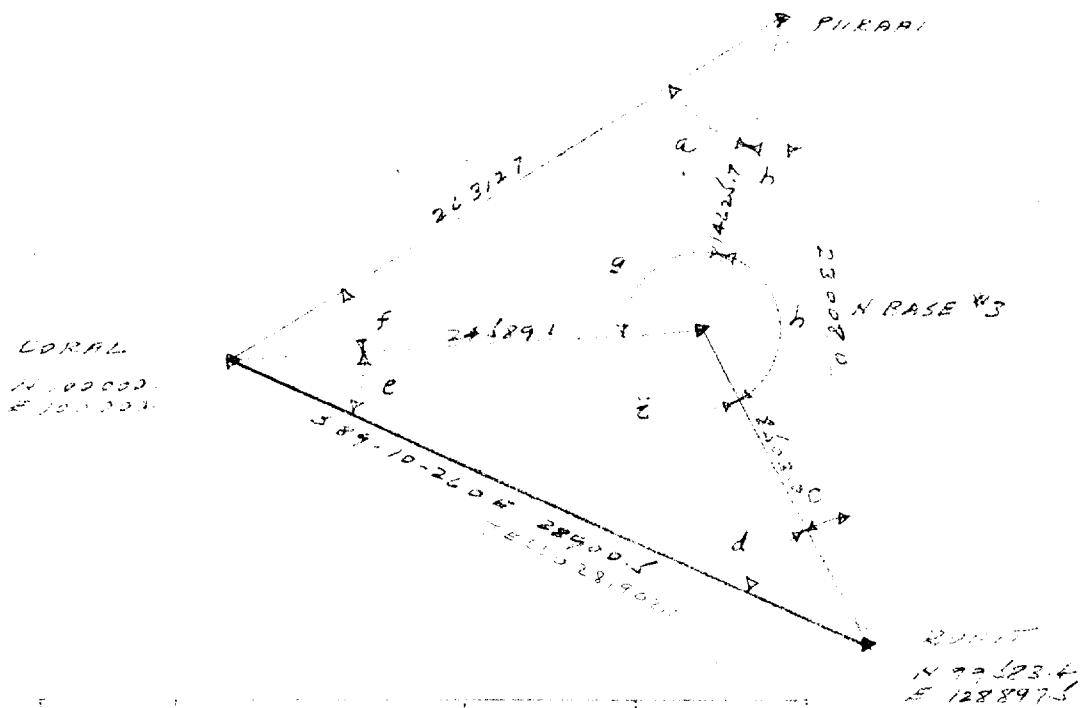
BY A.R.B. DATE July 1947
CHKD. BY E.S.H. DATE Nov 1947

SUBJECT TRANGULATIION
1952 EXPANSION

SHEET NO. / ... OF ... /

JOB NO. 831

NBASF*, PIRARI



	OBS. #	GEO. COND.	TRIG. COND
a	62 - 56 - 37.8	27.7	364
b	4 - 27 - 29.0	29.9	31.2
c	7 - 41 - 04.6	05.4	04.1
d	51 - 57 - 04.9	03.7	05.0
e	15 - 48 - 10.3	09.0	02.7
f	33 - 10 - 34.4	24.3	23.6
g	79 - 53 - 48.1	48.0	48.0
h	167 - 51 - 23.6	24.7	24.7
i	112 - 14 - 48.2	47.3	47.3

$$\text{Trig Cond. (Side equation)} = \frac{\sin a \cdot \sin c \cdot \sin e}{\sin b \cdot \sin d \cdot \sin f} = 1$$

Log. 5 m. at	9.9437912	9.2	Log. 5 m. b	8.88906089	271
c	9.1262089	1561	d	9.8902419	161
e	9.4350831	764	f	9.3821584	342
d	9.12620832	2392	g	9.250052	314.2
	0.092	319.2			
	740	1592		740/1592 = 1.3"	

28900.4 S. 59-38-091 S. 58-38-48-3
S. 71-23-076 126312712 123008341

28300.5 SIN 51-57-060 SIN 12-28-000
SIN 112-14-473 (24589.12) (28.23.03)

24589-1209 Sin 79-53-480 Sin 33-19-31
53-10-55-364 (26312.71) 14025-16-1

HOLMES & NARVER INC., ENGINEERS

COMPUTATION OF TRIANGLES

COMPUTED BY A.R.B. CHECKED BY L.S.H. DATE 7-7-52

STATION	OBSERVED ANGLE	CORR-N	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3						3.9449227
1 N. Base #3	112-14-48.3	- 1.0	47.3	0.0	47.3	0.0335937
2 Runit	51-57-04.9	+ 0.1	05.0	0.0	05.0	9.8962440
3 Coral	15-48-10.3	- 2.6	07.7	0.0	07.7	9.4350734
I-3	03.5				7494.81	3.8747604
I-2					2591.73	3.4135898
2-3						3.8747605
1 Piiraai	66-55-37.8	- 1.3	36.5	0.1	36.4	0.0362099
2 N. Base #3	79-53-48.1	- 0.1	48.0	0.0	48.0	9.9932126
3 Coral	33-10-34.4	+ 1.2	35.6	0.0	35.6	9.7381626
I-3	00.3				8020.16	3.9041830
I-2					4457.93	3.6491330
2-3						3.9449227
1 Piiraai	71-23-06.8	+ 0.9	07.7	0.1	07.6	0.0233349
2 Runit	59-38-09.5	- 0.4	09.1	0.0	09.1	9.9359254
3 Coral	48-58-44.7	- 1.4	43.3	0.0	43.3	9.8776394
I-3	01.0				8020.16	3.9041830
I-2					7012.89	3.8458970
2-3						
I						
2						
3						
I-3						
I-2						

$\epsilon = 0.0$

HOLMES & HARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMPUTED BY L.S.H. DATE Nov. 1952.

α	2 Runit	$t_0 \beta$	Coral	90	50	32.02	α	3 Coral	$t_0 2$	Runit	270	49	34.0
$\Delta \phi$				+ 51	57	05.0	$3\Delta \beta$				8	- 15	48
α'	Runit	$t_0 1$	N. Base #3	142	47	37.2	α	3 Coral	$t_0 1$	N. Base #3	255	01	26.3
$\Delta \alpha$				-	10.4	$\Delta \alpha$				+	47.8		

α'	N. Base #3	$t_0 2$	Runit	322	47	26.8	α	N. Base #3	$t_0 3$	Coral	75	02	14.1
α'							α'				180	00	00.0

FIRST ANGLE OF TRIANGLE

ϕ	11 32 16.0802	Runit	α	162 22 01.621	ϕ	11 32 20.2543	Coral	λ	162 17 10.944
$\Delta \phi$	+ 1 07.181		$\Delta \lambda$	- 51.723	$\Delta \phi$	+ 1 03.007		$\Delta \lambda$	+ 3 58.953
ϕ'	11 33 23.2621	N. Base #3	λ'	162 21 09.898	ϕ'	11 33 23.2621	N. Base #3	λ'	162 21 09.893

Logarithms values in seconds

$\frac{1}{2}(\phi + \phi')$	11 32 49.670	s	3.8747583	$\frac{1}{2}(\phi + \phi')$	11 32 51.557	s	3.8747583
Logarithms values in seconds	Cos α	9.4123176		Logarithms values in seconds	Cos α	9.9849925	
s	3.4135881		B	8.6124997		A	8.5096677
$\sin \alpha$	9.7615307		B	1.7995755	1st term	- 63.0341	
A	8.5096680			7.74952		Sec ϕ'	0.0088946
Sec ϕ'	0.0088946			Sin ² α	9.97199		- $\Delta \lambda$
$\Delta \lambda$	1.7136814	+ 51.7227	C	0.71669		2.3763131	- 238.9534
$\sin_2(\phi + \phi')$	9.3014075			8.43820	2d term	$\sin \frac{1}{2}(\phi + \phi')$	9.3014269
$\Delta \alpha$	1.0150889	+ 10.354	D	3.5992		- $\Delta \alpha$	1.6797400
				1.9845			47.834
				5.5837	3d term	+ 0.00000	
					- $\Delta \phi$	- 63.0067	
							62

$\epsilon = 0.1$

HOLMES & MARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMPUTED BY L.S.H. DATE Nov. 1952

α	2 N. Base #3 to 3 Coral	75	02	14.1	α	3 Coral	to 2 N. Base #3	255	01	26.3
$\Delta \alpha$	8	+ 79	53	48.0	$\Delta \alpha$	3dL	8	- 33	10	35.6
α	2 N. Base #3 to 1 Piirasi	154	56	02.1	α	3 Coral	to 1 Piirasi	221	50	50.7
$\Delta \alpha$				12.5	$\Delta \alpha$		+			35.4

α'	Piirasi	to 2 N. Base #3	334	55	49.6	α'	Piirasi	to 3 Coral	41	51	26.1
α'						α'					

FIRST ANGLE OF TRIANGLE 66-66-36.5

ϕ	11 33 23.262 2 N. Base #3	162	21	09.898	ϕ	11	32	20.254	3 Corel	162	17 10.944
$\Delta \phi$	+ 2 11.421	-	1	02.341	$\Delta \phi$	+ 3	14.428		$\Delta \lambda$	+ 2	56.613
ϕ'	11 35 34.687 1 Piirasi	162	20	07.657	ϕ'	11	35	34.682	1 Piirasi	162	20 07.567

Logarithms Values in seconds Logarithms Values in seconds Logarithms Values in seconds

$\frac{1}{2}(\phi + \phi')$	11 34 28.972	$\frac{1}{2}(\phi + \phi')$	11 33 37.468
Logarithms	Values in seconds	Logarithms	Values in seconds
3.6491323	9.6270209	3.6491323	9.8721121
$\sin \alpha$	8.5096676	$\sin \alpha$	9.8242229
B	8.5124997	B	A 8.5096677
h	2.2887932 1st term	h	$\sec \phi' 0.0089513$
$\cos \alpha$	9.9570418	$\cos \alpha$	$\sec^2 \phi' 9.64845$
$\Delta \alpha$	8.5124992	$\Delta \alpha$	$-\Delta \lambda 2.2470233 - 176.6133$
h	2.1186733 1st term	h	$\sin \alpha 9.3018998$
$\cos \alpha$	7.29826	$\cos \alpha$	$-\Delta \alpha 1.5489231 - 35.393$
$\sin \alpha$	9.25404	$\sin \alpha$	$-\Delta \phi -194.4281$
0.71736	0.71736	0.71736	
7.26966	2d term + 0.0019	8.17350	
4.2374	1.0972017 +12.508	4.5776	
1.9861		D 1.9845	
6.2225	3d term + 0.0002	6.5621	
		6.5621	3d term + 0.0004
			$-\Delta \phi -194.4281$

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REVIEWS AND COMMENTATIONS

HOLMES & NASSER, INC.
ENGINEERS - CONSTRUCTORS

1952 EXPANSION OF HORIZONTAL COORDINATES - JULY 1951

1982 EDITION

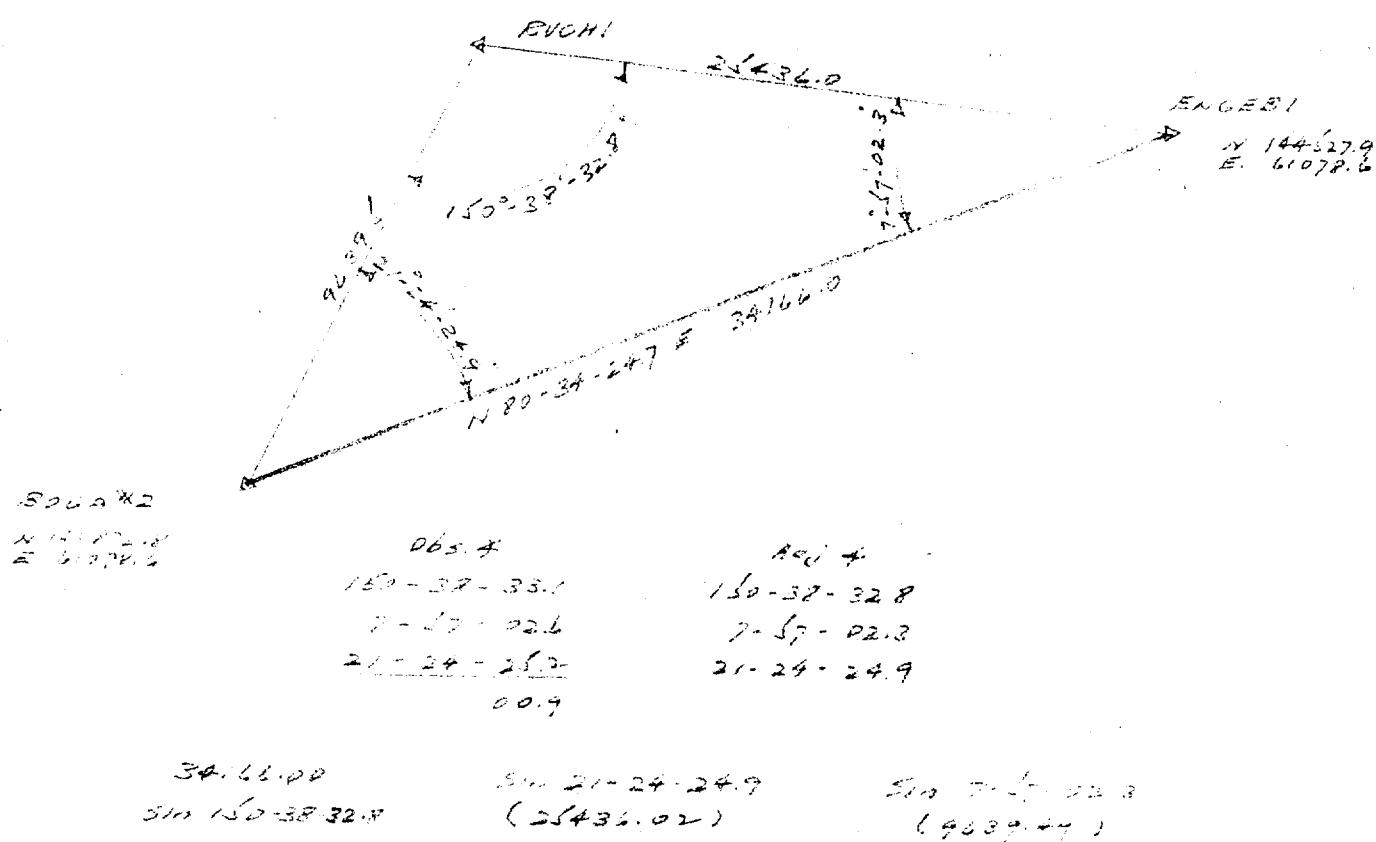
SECTION Pushi, Fujoru, Aisu, Izu

10-28-52
DATE
CALC. BY ABB

BY 456 DATE July 1970
CHKD. BY 456 DATE July 1970

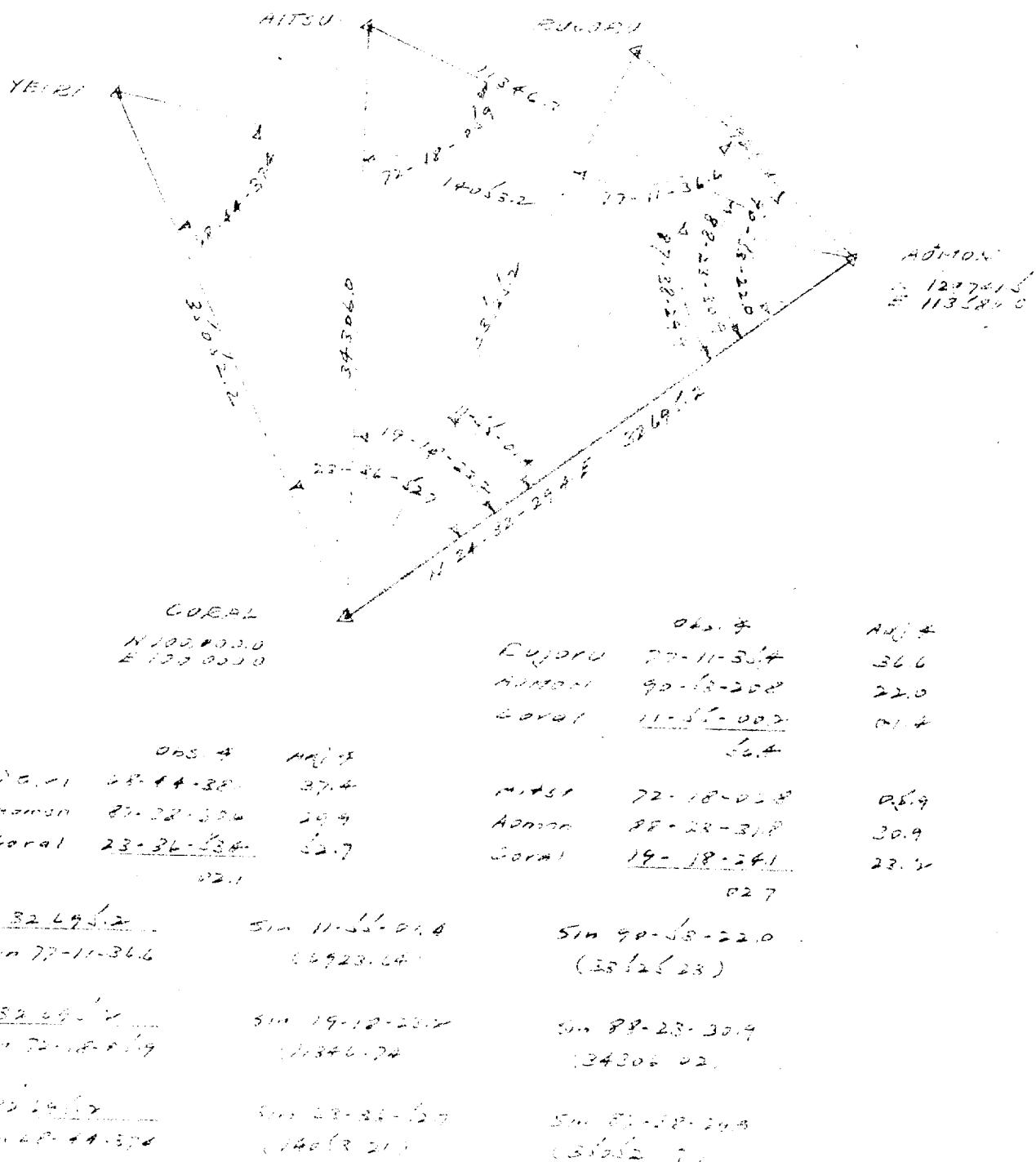
SUBJECT TELIANA KARATIACU AREA
1962 EXPANSION

SHEET NO. 1 OF 1
JOB NO. 831
EUCHI



BY A.B.E. DATE July 1958 SUBJECT Tideline & Kelp Forest Survey
CHKD. BY E.H. DATE Aug 1958

SHEET NO. 1 OF 1
JOB NO. P.P.
151 California Lizard



COMPUTATION OF TRIANGLES

COMPUTED BY A.R.B. CHECKED BY I.S.H. DATE 7-7-52

STATION	OBSERVED ANGLE	CORR-N	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3						4.0176101
1 Ruchi	150-36-33.1	- 0.3	32.8	0.0	32.8	0.3095761
2 Engebi	7-57-02.6	- 0.3	02.3	0.0	02.3	9.1408848
3 Boga #2	21-24-25.2	- 0.3	24.9	0.0	24.9	9.5622800
1-3	00.9				2938.12	3.4680700
1-2					7752.92	3.8894652
						RUCHI
2-3						3.9985000
1 Rujoru	77-11-35.4	+ 1.2	36.6	0.0	36.6	0.0109400
2 Aomon	90-53-20.8	+ 1.2	22.0	0.0	22.0	9.9999477
3 Coral	11- 55-00.2	+ 1.2	01.4	0.0	01.4	9.3149105
1-3	56.4				10218.51	4.0093877
1-2					2110.33	3.3243505
						RUJORU
2-3						3.9985000
1 Aitsu	72-18-06.8	- 0.9	05.9	0.0	05.9	0.0210575
2 Aomon	88-23-31.8	- 0.9	30.9	0.0	30.9	9.9998289
3 Coral	19-18-24.1	- 0.8	23.3	0.1	23.2	9.5193298
1-3	02.7				10456.50	4.0193863
1-2					3458.49	3.5388872
						AITSU
2-3						3.9985000
1 Yeiri	68-44-38.1	- 0.7	37.4	0.0	37.4	0.0305889
2 Aomon	87-38-30.6	- 0.6	30.0	0.1	29.9	9.9996320
3 Coral	23-36-53.4	- 0.7	52.7	0.0	52.7	9.6026927
1-3	02.1				10683.93	4.0287309
1-2					4283.43	3.6317916
						YEIRI

$\epsilon = 0.0$

HOLMES & MARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMPUTED BY L.S.H. DATE Nov. 1952

α	2	Boga #2	Engebi	260	32	49.1	α	3	Engebi	to 2	Boga #2	80	33	57.5
$\Delta \alpha$				+ 21	24	24.9	$\Delta \alpha$				8	- 7	57	02.3
α	2	Boga #2	Ruchi	281	57	14.0	α	3	Engebi	to 1	Ruchi	72	36	55.2
$\Delta \alpha$				+ 18.2	$\Delta \alpha$						-	49.3		

α'	1	Ruchi	Boga #2	101	57	33.0	α'	Ruchi	to 3	Engebi	180	66	00.0
α'											252	36	05.9

FIRST ANGLE OF TRIANGLE 150-38-32.8

α	11	36	46.355	2	Boga #2	α	162	09	15.997	ϕ	11	39	41.964	3 Engebi	
$\Delta \phi$						$\Delta \alpha$	+	1	34.995	$\Delta \phi$	- 1	15.420		$\Delta \lambda$	
ϕ'	11	38	26.545	4	Ruchi	α'	162	10	50.892	ϕ'	11	38	26.544	Ruchi	
$\Delta \phi'$															
$\log \alpha$	3.4680710	11	38	36.450	s	3.8694648	$\frac{1}{2}(\phi + \phi')$	11	39	04.254	$\log(\phi + \phi')$	11	39	04.254	Logarithms Values in seconds
$\log \alpha$	9.3162313						$\log \alpha$	9.4763594							Logarithms Values in seconds
$\log \alpha$	9.5124964						$\log \alpha$	9.5124954							Logarithms Values in seconds
$\log \alpha$	1.2967987	1st term	+19.8061				$\log \alpha$	1.8773196	1st term	+76.3910					Logarithms Values in seconds
$\log \alpha$	6.933614						$\log^2 \alpha$	7.77893							Logarithms Values in seconds
$\log^2 \alpha$	9.98096						$\log^2 \alpha$	9.95939							Logarithms Values in seconds
$\log \alpha$	0.72055	2d term	+0.0043				$\log \alpha$	1.9772418	-94.8947	C	0.72204				Logarithms Values in seconds
$\log \alpha$	7.63765						$\log \alpha$	9.3049661							Logarithms Values in seconds
$\log \alpha$	2.5936						$\log \alpha$	1.2822079	-19.152	η^2	3.7546				Logarithms Values in seconds
$\log \alpha$	1.9884						$\log \alpha$			D	1.9894				Logarithms Values in seconds
$\log \alpha$	4.5820	3d term	+0.00000				$\log \alpha$				5.7440	3d term	+ 0.0001		Logarithms Values in seconds
$\log \alpha$							$\log \alpha$								Logarithms Values in seconds

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**HOLMES & HARVER, INC.
ENGINEERS-CONSTRUCTORS**

POSITION COMPUTATION TRIANGULATION ORDER SECOND

DATE NOV 1952

COMPUTED BY		L.S.H.	DATE	Nov. 1952
2	Aomon	to 3	Coral	24
8				32
+	90	53	22.0	3d/
	Rujoru	115	26	18.8
	Aomon	to 1	Coral	204
				32
				29.4
			- 11	55
	Rujoru	192	37	28.0
				+ 14.8

Elkast LINSI E GE Tiansi E 77-11-36.6

$\frac{1}{2}(\phi + \phi')$		11		35		02.518	
		Logarithms		Values in seconds		Seconds	
3.3243483		11	37	30.033	s	4.0093871	
9.6335005							
3.5124972	s	3.3243483					
1.4698520	1st term	-29.5020	Sin α	9.9557101			
6.34870	A'						
9.611142	Sec ϕ'	0.0090075					
0.71982	- $\Delta \lambda$	1.7987328	+62.9119	C	0.71669		
7.27994	2d term	+ 0.0019					
2.9397	- $\Delta \alpha$	1.1050196	+12.677	n^2	6.0225		
1.9875	D	1.9845					
4.9272	3d term	+ 0.0000					
	- $\Delta \phi$	-29.5001					

HOLMES & MARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMPILED BY T.S.W. DATE Nov. 1952

$\frac{1}{2}(\phi + \phi')$	Logarithms	Values in Cosec.	0.0001947
11 37	37.218	s	4.0193859
3.5388853			9.5908234

Subjects		seconds		seconds		seconds		seconds	
8.5124972									
1.6422059	1st term	-43.8739		5.5388853	S	3.5124998	B	8.5124998	
7.07777				Sin α	9.9642156	h	2.5300704	1st term	-338.8990
9.92843				A'	8.5096669				4.0193859
0.71982				Sec ϕ'	0.0090138				8.9601919
7.72602	2d term	+ 0.0053		Sin ² α	7.92038				8.5096677
3.2844				- $\Delta \lambda$	2.0217816	+ 105.1433	C	0.71669	0.0090138
1.9375				Sin ² ($\alpha + \phi$)	9.3033604				Sec ϕ'
5.2719	3d term	+ 0.0000		- $\Delta \alpha$	1.3251420.	+ 21.142	n ²	5.0601	- $\Delta \lambda$
							D	1.9845	1.4982593
								7.0446	-31.4963
									0.8011074
									- 6.326
									0.0011
									338.8666
									- $\Delta \phi$

$\epsilon = 0.1$

HOLMES & MARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMPUTED BY L.S.H. DATE Nov. 1952

α	2 Aomon	3 Coral	24 32	56.8	3	Coral	10 2	Aomon	204	32	29.6
$\Delta \alpha$			+ 87	38	30.0	342			- 23	36	52.7
α	2 Aomon	10 1 Yeiri	112 11	26.8	α	3 Coral	10 1	Yeiri	180	55	36.7
$\Delta \alpha$			-	26.4	$\Delta \alpha$				+ 01.1		

α'	1 Yeiri	2 Aomon	3 Coral	190	"	"	"	"	180	60	0.000
α	11 37 16.283	2 Aomon			162 19 27.584	ϕ	11 32 20.254	3 Coral			
$\Delta \alpha$	+ 52.645				- 2 10.934	$\Delta \phi$	+ 5 47.674				
α'	11 38 07.926	1 Yeiri			162 17 16.560	ϕ	11 38 07.928	1 Yeiri			

$\log \sin \alpha$	$\log \sin \alpha'$	$\log \sin (\alpha + \phi)$	$\log \sin (\alpha' + \phi')$	$\log \sin (\alpha + \phi')$	$\log \sin \alpha'$	$\log \sin \alpha$	$\log \sin \alpha'$	$\log \sin (\alpha + \phi)$	$\log \sin (\alpha' + \phi')$	$\log \sin \alpha$	$\log \sin \alpha'$
3.6317906	3.6317906	11 37 41.605	11 36 40.911	4.0287311							
9.5771375	9.5771375				9.9999432						
8.5124972	8.5124972				8.5124998						
1.7214263	1.7214263				2.5411741	1st term - 347.6755					
7.26358	7.26358										
9.93316	9.93316										
0.71982	0.71982										
7.91656	7.91656										
3.4429	3.4429										
1.9875	1.9875										
5.4304	5.4304										

HOLMES & NARVAEZ, INC.
ENGINEERS-CONSTRUCTORS

TRAVERSE COMPUTATIONS

CALC. BY L.S.H. CHECKED BY DATE 11-12-52

PLANE COORDINATES - IVY GRID
19'2 EXPANSION OF HORIZONTAL CONTROL

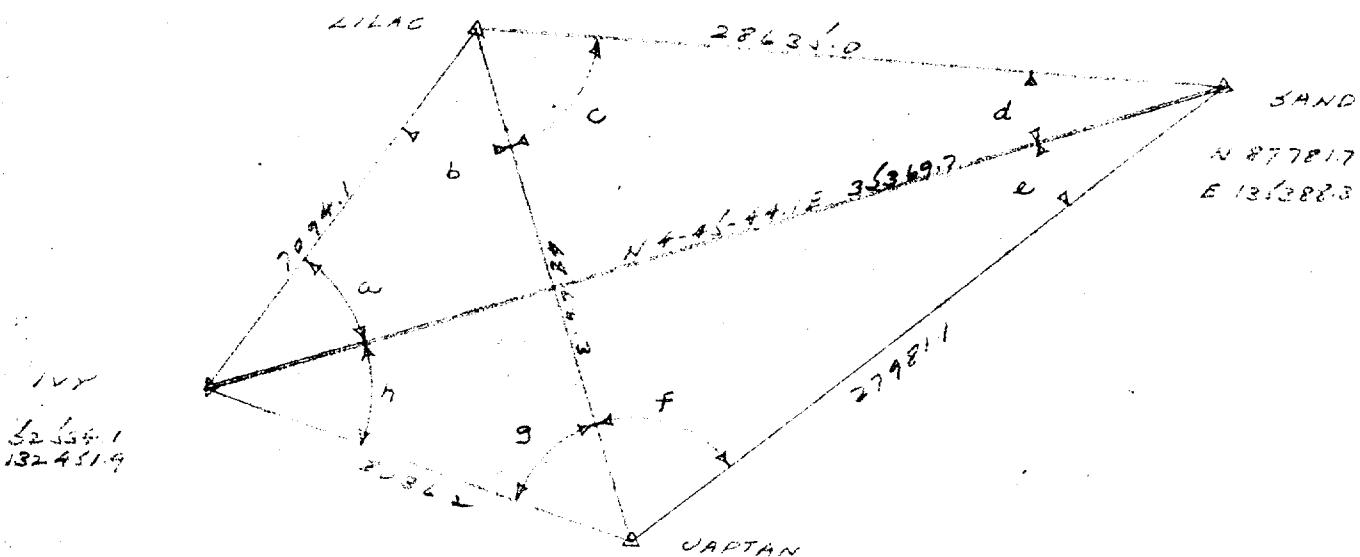
JOB NO. 831 LOCATION Japtan, Lilac

STATION	COURSE	DISTANCE	COSINE	SINE	LATITUDE		DEPARTURE		COORDINATES		
					NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST
1. Japtan	S 0°55'-E	2754.1.1	.999950	.0173491	2754.669	2754.669	Lst. 561	67781.68	135888.31	1	
2. Japtan	S 25°42'-E	3920.2	.592460	.8074598	727.741	727.741	2L22.957	59804.81	135874.87	2	
3. Lst.	S 12°35'-W	7054.1	.9793871	.2193601	(9917.952)			52534.97		13251.88	3
4. Japtan	S 64°32'-E	2120.9	.26136	.9652623	2120.939	2120.939	L365.976	59482.02	130119.33	4	
5. Japtan								87781.66	135568.31		5
6.									135.385.31		6
7. Japtan											7
8. Japtan	S 60°1-61°2E	4364.3	.86632532	.52775735	322.510	485.501		59482.02	130119.33		8
9.								59804.83	135874.91		9
10.											10
11.											11
12.											12
13.											13
14.											14
15.											15
16.											16
17.											17
18.											18
19.											19
20.											20
21.											21
22.											22
23.											23
24.											24
25.											25
26.											26
27.											27
28.											28
29.											29
30.											30

BY L.S.H. DATE _____
CHKD. BY L.S.H. DATE *Nov. 15, 1947*

SUBJECT TRAINING FACILITY AND
1962 EXPANSION

SHEET NO. 1 OF 1
JOB NO. 83.1
LIBAC - GFTAN



	080. 4	GEO. COND.	TRIG. COND.
w	16-24-43.3	43.9	43.3
b	82-09-09.5	10.1	10.6
c	77-25-12.7	12.9	13.4
d	4-00-48.8	49.8	49.7
e	5-45-32.4	32.9	31.5
f	92-48-26.3	26.9	25.4
g	60-39-09.5	10.1	09.7
h	20-26-53.3	53.9	53.4
	53.4		53.9

$$\frac{\sin A \cdot \sin C \cdot \sin E \cdot \sin G}{\sin B \cdot \sin D \cdot \sin F \cdot \sin H} = 1$$

Log. Sun a	9.4510985	215'	Log Sun. b	9.9959144	2.9
" " c	9.9894473	47	d	88450784	300.1
" " e	9.0014741	2078	f	9.9994786	1.0
" " g	9.9417695	117	h	9.5432233	46.1
	8.3837804	296.7		8.3837467	360.9
	402	402.9			
	317	317.6		317.1617.6 = 0.54."	

32369.7 Sim 16-24-44.2 Sim 4-60-50.2
Sims 159-34-21.0 (28634.6) 2066.0

251369-7 200-20-23-53-9
5in 123-47-35-1 (22980-06) 500-5-45-34-1

286349 9-46-21-2 286349
sin 72-48-239 (486626) 286349

~~8036.22~~ 214-36-51-28.7 ~~8036.22~~ 214-36-51-29.7
~~5100 82-29-20~~ 4866.27 1234 1234

COMPUTATION OF TRIANGLES

COMPUTED BY	L.S.H.	CHECKED BY	L.S.H.	DATE	Nov. 1952	
STATION	OBSERVED ANGLE	CORR-N	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3						
1 Japtan	153-47-35.8	- 0.7	35.1	0.0	35.1	4.0326473
2 Ivy	20-26-53.3	+ 0.6	53.9	0.0	53.9	0.3549571
3 Sand	5-45-32.4	- 1.4	31.0	0.0	31.0	9.5432759
I-3					8526.65	9.0014637
I-2					2449.45	3.9306803
						JAPTAN
2-3						
1 Lilac	159-34-21.8	+ 3.2	25.0	0.0	25.0	4.0326473
2 Sand	4-00-48.8	+ 1.4	50.2	0.0	50.2	0.4571700
3 Ivy	16-24-43.3	+ 1.5	44.8	0.0	44.8	8.8450934
I-3	53.9				2162.27	9.4510950
I-2					8727.95	LILAC
						3.3349107
2-3						
1						
2						
3						
I-3						
I-2						
2-3						
1						
2						
3						
I-3						
I-2						

POSITION COMPUTATION

COMPUTED BY L.S.H. DATE Nov. 1952.

FIRST CYCLE OF TRIANGLE 159-34-250
180 Sand 188 47 36.4

values in seconds

HOLMES & MARVEL,
INC.
ENGINEERS - CONSTRUCTORS

TRAVERSE COMPUTATIONS

CALC. BY A.R.B.
CHECKED BY A.S.H.
DATE 11-5-52

PLANE COORDINATES - IVI GRID
1952 ADJUSTED HORIZONTAL CONTROL

JOB NO. 821 LOCATION Coral, Pinnacle

STATION	COURSE	DISTANCE	SINE	COSINE	LATITUDE		DEPARTURE		COORDINATES	
					NORTH	SOUTH	EAST	WEST	EAST	WEST
1 Coral	N 75-01-20.1E	21588.01	.25844392	.96502626	6354.828		23753.436		100,000.00	100,000.00
2 N. Base #2	S 37-13-22.1E	8503.84	.79620921	.60491612		6771.516	5144.110		106,354.83	123,753.436
3 Runit	S 69-33-36.7W	14461.36	31922313	93703959		5050.211		13550.867	99,583.31	128,897.55
4 Pinnacle	N 70-23-33.5E	16291.34	33557262	91201134		5466.928		15346.676	94,533.07	115,316.68
5 Coral									100,000.00	100,000.00
6										
7										
8 Coral	S 89-10-26.0E	28900.56	.01441786	.99989606		116584	28897.556		100,000.00	100,000.00
9 Runit									99,583.32	128,897.556
10										
11										
12 N. Base	S 35-25-03.3W	21506.11	81161999	51953129		11021754	8106.745		106,354.83	123,753.436
13 Pinnacle									94,533.07	115,316.68
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										

BY A.R.B. DATE July 1957
CHKD. BY L.S.H. DATE JULY 1957

SUBJECT TRIANGULATION ADJ.
1952 ADJUSTMENT

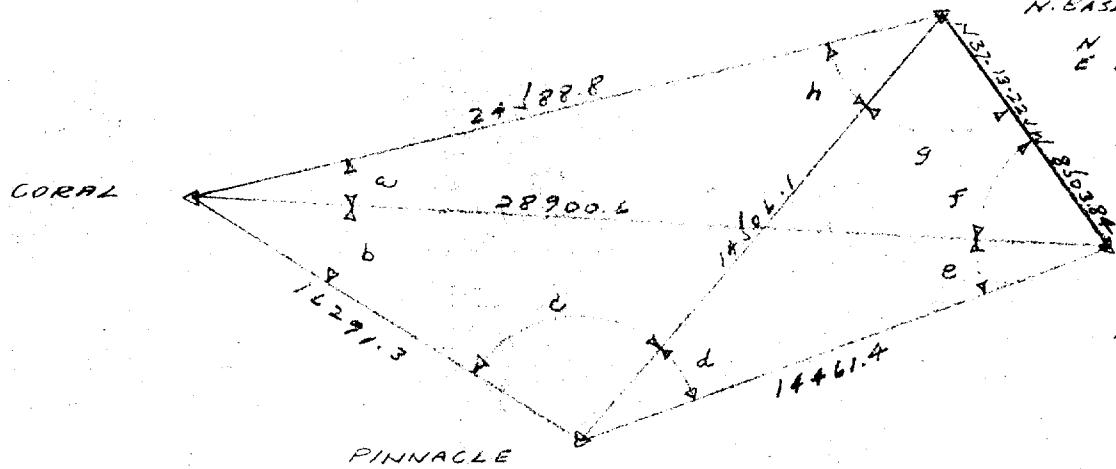
SHEET NO. 1 OF 1

JOB NO. 821

CORAL PINNACLE

N. EASE #2

N 1063 418
E 123753.4



RUN 1
N 99583.3
E 128897.6

OBS. #	GEO. COND.	TRIG. COND.
a	15-48-14.6	144
b	18-46-52.6	52.3
c	105-48-37.3	37.1
d	34-07-33.1	32.9
e	21-15-57.7	57.4
f	51-57-03.8	03.6
g	72-38-25.8	25.6
h	39-36-17.0	16.7
	01.9	

$$\text{Side Eq. } \sin a \cdot \sin g \cdot \sin e \cdot \sin c = 1 \\ \sin b \cdot \sin h \cdot \sin f \cdot \sin d$$

Log. sin. a	9.4351218	74.4	Log. sin. b	9.5077945	61.9
" " g	9.9797438	6.6	" " h	9.8044704	26.4
" " e	9.5595454	54.1	" " f	9.8962417	16.4
" " c	9.9832513	5.0	" " d	9.7491592	31.1
	8.9576724	141.1		8.9576656	134.9
	656	134.9		69.1276	= 0.25 "
	69	276.6			

8/03 84
Sin 15-48-13.9

Sin. 112-14-42.2
(28900.6)

Sin 51-57-03.9
(24588.82)

28900.6
Sin 139-57-12.2

Sin. 18-46-52.5
(14461.37)

Sin 21-15-57.3
(16291.35)

8/03.84
Sin 34-07-33.4

Sin. 73-13-01.2
(14506.11)

Sin 72-38-25.4
(14461.35)

14506.11
Sin 39-36-16.8

Sin. 39-36-16.8
(16291.34)

Sin. 105-48-36.8
(24588.81)

COMPUTATION OF TRIANGLES

COMPUTED BY A.R.B. CHECKED BY L.S.M. DATE 12-11-51

STATION	OBSERVED ANGLE	CORR-N	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3					2591.9749	3.4136308
1 Pinnacle	34-08-33.1	+0.3	33.4	0.0	33.4	0.2508401
2 North Base #2	72-38-25.8	-0.4	25.4	0.0	25.4	9.9797536
3 Runit	73-13-01.8	-0.3	01.2	0.0	01.2	9.9810958
I-3					4407.83	3.6442245
I-2					4421.47	3.6455667
2-3					4421.47	3.6455667
1 Coral	34-35-07.2	-0.6	06.4	0.0	06.4	0.2459348
2 North Base #2	39-36-17.0	-0.2	16.8	0.0	16.8	9.8044712
3 Pinnacle	105-48-37.3	-0.4	36.9	0.1	36.8	9.9832515
I-3					4965.61	3.6959727
I-2					7494.68	3.8747530
2-3					2591.9749	3.4136308
1 Coral	15-48-14.6	-0.7	13.9	0.0	12.9	0.5648804
2 North Base #2	112-14-42.8	-0.6	42.2	0.0	42.2	9.9664107
3 Runit	51-57-03.8	-0.1	03.9	0.0	03.9	9.8962422
I-3					8808.90	3.8449219
I-2					7494.68	3.8747534
2-3					8808.90	3.8449219
1 Pinnacle	139-57-10.4	-0.2	10.2	0.0	10.2	0.1815068
2 Coral	18-46-52.6	-0.1	52.5	0.0	52.5	9.8077964
3 Runit	51-15-57.7	-0.4	57.3	0.0	57.3	9.8036439
I-3					4407.83	3.6442251
I-2					4965.61	3.6959726

0.00

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMPLETED BY A.R.B. DATE Feb. 1952

FIRST ANGLE OF TRIANGLE 15-48-13.9

The figures indicated with * were accepted from the 1949-50 Horizontal Control Survey.

POSITION COMPUTATION **SECOND ORDER TRIANGULATION**

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COMPUTED BY A.R.B. DATE Feb. 1952.

HOLMES & SAWYER, INC.
ENGINEERS-CONSTRUCTORS

TRAVERSE COMPUTATIONS

CALC. BY A.R.B.

DATE 11-3-52

CHECKED BY I.S.H.

PLANE COORDINATES - IVY GRID
1952 ADJUSTED HORIZONTAL CONTROL

88

STATION	COURSE	DISTANCE	COSINE	SINE	LATITUDE		DEPARTURE		COORDINATES		LOCATION	SAND, PARTY
					NORTH	SOUTH	EAST	WEST	NORTH	SOUTH		
1 Coral	N 75-01-20.18	24588.81	25844.392	966502626	6351.828		23753.436		100,000.00		100,000.00	
2 N. Base #2	S 32-03-52.08	21916.16	80745152	53087279		18573.137	11634.852		106,354.83		123,753.44	2
3 Sand	S 348-10.58	33604.15	99778844	06616982		33528.632			87,781.69		135,388.28	3
4 Party	N 35-55-53.88	56198.87	80971801	58681918	45718.15				54,251.86		133,154.63	4
6 Coral							33154.621		100,000.00		100,000.00	5
6												6
7												7
8 Coral	S 70-57-07.38	37428.18	32635970	94524565		12216.313	35388.277		100,000.00		100,000.00	8
9 Sand									87,781.69		135,388.28	9
10												10
11												11
12 N. Base #2	S 10-13-11.25	52944.35	98110661	17756759		52102.991	9101.201		106,354.83		123,753.44	12
13 Party									54,251.84		133,154.64	13
14												14
15												15
16												16
17												17
18												18
19												19
20												20
21												21
22												22
23												23
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27												27
28												28
29												29
30												30

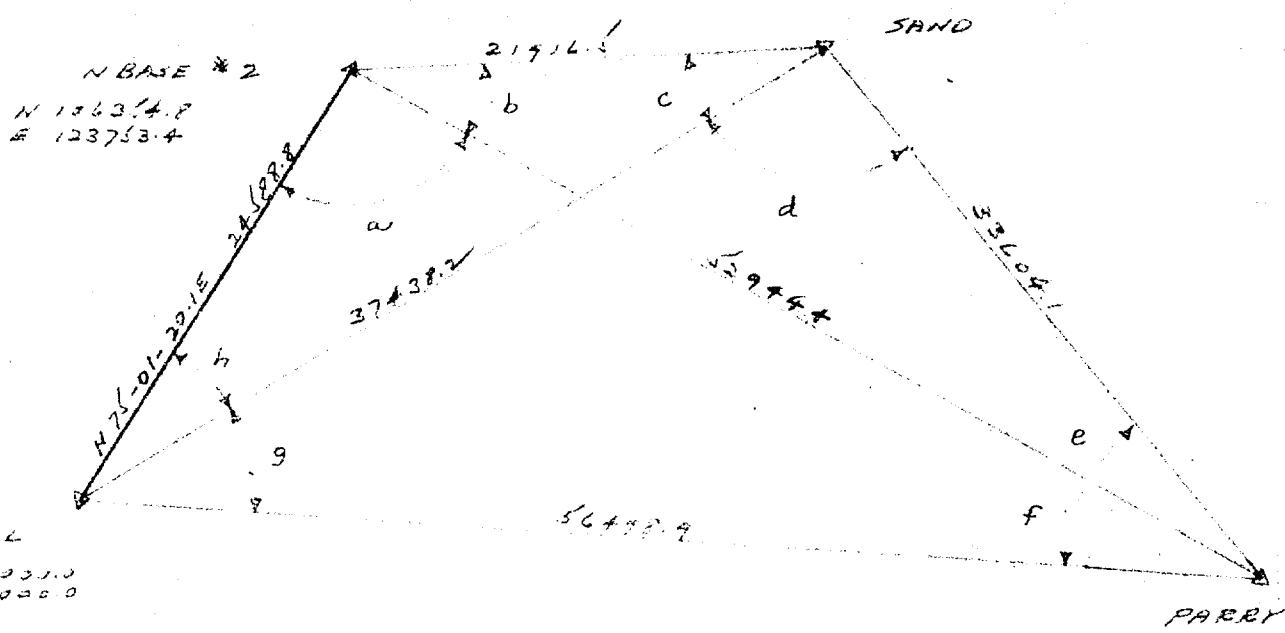
BY A.R.B. DATE July 1952 SUBJECT PLATEAU TIDE ADJ.

CHKD. BY L.S.H. DATE NOV. 1952 1952 ADJUSTMENT

SHEET NO. 1 OF 1

JOB NO. 831

PARRY, SAND



	OBS. #	GEO. COND.	TRIG. COND.
a	86-15-00.3	00.3	00.9
b	21-50-10.6	10.6	11.2
c	38-58-14.2	14.3	14.9
d	105-14-18.1	13.1	12.6
e	14-02-24.8	21.8	21.3
f	25-42-13.5	13.6	13.0
g	35-01-13.8	13.8	13.1
h	34-01-32.5	32.5	32.6

$$\text{Side Eq. } \sin a \cdot \sin c \cdot \sin e \cdot \sin g = 1$$

$$\sin b \cdot \sin d \cdot \sin f \cdot \sin h$$

Log. Sin a	9.9985068	1.7	Log Sin b	9.9704943	52.5
" " c	9.7978163	26.1	" " d	9.9844188	1.7
" " e	9.3848667	84.2	" " f	9.6372053	43.7
" " g	9.7588110	38.0	" " h	9.6478518	31.7
	2.9402220	142.0		8.9400102	133.1

245.88.8	$\sin 107-05-12.1$	$\sin 34-01-32.6$	$\frac{500}{102} = 4.87$
$\sin 38-58-14.3$	(374.38)	$(219.16.46)$	
374.38.18	$\sin 35-01-13.8$	$\sin 105-14-18.1$	
$\sin 34-01-32.5$	$(336.04.11)$	$(219.16.48)$	
245.88.8	$\sin 65-02-42.1$	$\sin 86-15-00.3$	
$\sin 25-42-13.5$	$(52.54.35)$	$(56.498.88)$	
329.44.31	$\sin 21-50-10.6$	$\sin 14-02-24.8$	
$\sin 14-02-24.8$	$(336.04.15)$	$(219.16.48)$	

COMPUTATION OF TRIANGLES

COMPUTED BY A.R.B. CHECKED BY T.S.H. DATE 12-31-51

STATION	OBSERVED ANGLE	CORR-N	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3					7494.68	3.8747531
1 Sand	38-53-14.2	+1.1	16.3	0.0	16.3	0.2021826
2 Coral	34-01-32.5	+0.1	32.6	0.0	32.6	9.7478506
3 North Base #2	107-05-10.9	+1.3	12.2	0.1	12.1	9.9803948
I-3					5880.15	3.8247863
I-2					11411.13	4.0573305
2-3					11411.18	4.0573305
1 Parry	39-44-35.3	-0.9	34.4	0.1	34.3	0.1942659
2 Coral	35-01-13.8	-0.2	13.6	0.1	13.5	9.7588122
3 Sand	106-14-13.1	-0.8	12.3	0.1	12.2	9.9844590
I-3					10242.56	4.0104086
I-2					17220.88	4.2560554
2-3					7494.68	3.8747531
1 Parry	26-42-13.5	-0.8	12.7	0.1	12.6	0.3627965
2 Coral	60-02-46.3	-0.1	46.2	0.1	46.1	9.9702856
3 North Base #2	35-15-00.3	+1.1	01.4	0.1	01.3	9.9985061
I-3					16137.47	4.2076354
I-2					17220.89	4.2360557
2-3					16137.47	4.2076354
1 Sand	144-07-27.3	+0.3	27.6	0.1	27.5	0.2320211
2 Parry	14-02-21.8	-0.1	21.7	0.0	21.7	9.3848701
3 North Base #2	20-50-10.6	+0.2	10.8	0.0	10.8	9.5704922
I-3					5880.15	3.8247863
I-2					10242.56	4.0104087

$\epsilon = 0.1$

HOLMES & MARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION . SECOND ORDER TRIANGULATION

COMPUTED BY A.R.B. DATE Feb. 1952

α	2 Coral	to 3 North Base #2	255	01	20.1	α	3 North Base #2 to 2 Coral	75	02	07.9	
$\Delta \alpha$			+ 34	01	32.6	$3d\angle$		- 107	05	12.2	
α	2 Coral	to 1 Sand	289	02	52.7	α	3 North Base #2 to 1 Sand	327	56	55.7	
$\Delta \alpha$			+ 01	11.1		$\Delta \alpha$		+ 23.4			
α'	1 Sand	to 2 Coral	109	04	03.8	α'	Sand	+ 03 North Base #2	147	57	19.1

FIRST ANGLE OF TRIANGLE 38-53-16.3

ϕ	11 32 20.254 2 Coral	λ	162 17 10.944	ϕ	11 33 23.267 3 North Base #2	λ	162 21 09.893
$\Delta \phi$	- 02 01.268	$\Delta \lambda$	+ 05 55.926	$\Delta \phi$	- 03 04.281	$\Delta \lambda$	+ 01 56.977
ϕ'	11 30 18.986 1 Sand	λ'	162 23 06.870	ϕ'	11 30 18.986 1 Sand	λ'	162 23 06.870
Logarithms	Values in seconds	Logarithms	Values in seconds	Logarithms	Values in seconds	Logarithms	Values in seconds
3 4.0573308	$\frac{1}{2}(\phi + \phi')$	11 31 19.620	s 3.8247866	$\frac{1}{2}(\phi + \phi')$	11 31 51.127	Logarithms	Values in seconds
Log α 9.5136965 +		Logarithms	Values in seconds	Log α 9.9281777 +		Logarithms	Values in seconds
B 8.5124997		s 4.0573308		B 8.5124992		S 3.8247865	
h 2.0835270	1st term + 121.2068	sin α 9.9755447 II		h 2.2654634 1st term + 184.2737		sin α 9.7248301 II	
β^2 8.115	A' 8.5096681			β^2 7.660		A' 8.5096681	
sin α 9.951	Sec ϕ' 0.0088155			sin α 9.450		Sec ϕ' 0.0088155	
C .717	$\Delta \lambda$ 2.6613591 - 355.9255			C .717		$\Delta \lambda$ 2.0681002 - 116.9769	
8.783	2d term + .0607 sin $\frac{1}{2}(\phi + \phi')$ 9.3004785			7.817	2d term + .0066 sin $\frac{1}{2}(\phi + \phi')$ 9.3008037		
n^2 4.17	- $\Delta \alpha$ 1.8516376 - 71.09			n^2 4.63		- $\Delta \alpha$ 1.3689039 - 23.38	
1.98	D 1.98			D 6.51	3d term + .0003		
6.15	6.15 3d term + .0001				- $\Delta \phi$ + 184.2806		
	- $\Delta \phi$ + 121.2676						

$\epsilon = 0.3''$

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMPUTED BY A.R.B. DATE Feb. 1962.

α	2 Coral	$\Delta \alpha$	to 3 Sand	289	02	52.7	α	3 Sand	to 2 Coral	109	04	03.8
$2d\angle$		θ .		+ 35	01	13.6	$3d\angle$			- 105	14	12.3
α	2 Coral	$\Delta \alpha$	to 1 Parry	324	04	06.3	α	3 Sand	to 1 Parry	3	49	51.5
$\Delta \alpha$				+ 01	01	06.3	$\Delta \alpha$					04.5
α'	1 Parry	$\Delta \alpha$	to 2 Coral	144	05	12.6	α'	Parry	to 3 Sand	183	49	47.0

FIRST ANGLE OF TRIANGLE 39-44-34.4

Logarithms Values in seconds			Logarithms Values in seconds			Logarithms Values in seconds			Logarithms Values in seconds		
S	$\frac{1}{2}(\phi + \phi')$	11 28 33.314	S	4.0104089		S	$\frac{1}{2}(\phi + \phi')$	11 27	S	4.01C4089	
Cos α	9.90833394		Logarithms Values in seconds	Cos α	9.99902886 +	B	8.05126007		S	8.0086735	
B	8.5124997		S	4.2360652		H	2.5219381.	1st term + 332.6121	Sin α	8.8248627 +	
h	2.65688888	1st term + 453.8254	Sin α	9.7685040		S ²	8.021		A'	8.05096690	
g^2	8.472		A'	8.5096690		Sin ² α	7.650		Sec ϕ'	0.0086735	
Sin α	9.537		Sec ϕ'	0.0086735		C	.715		$\Delta \lambda$	1.3536141	+ 22.5743
C	.717		$\Delta \lambda$	2.5229017	"	6.386	2d term + .0002	$\sin \frac{1}{2}(\phi + \phi')$ 9.2981279	- $\Delta \alpha$.6617420	+ 4.48
8.726	2d term + .0532	Sin ² ϕ / 9.2987673	- $\Delta \alpha$	1.8216590	66.32	h^2	5.04		D	1.98	
H	5.31					D			7.02	3d term + .0010	
E	1.93								- $\Delta \phi$	+ 332.6133	
	7.29	3d term + .0020									
		- $\Delta \phi$									
		453.8806									

HOLMES & MARVER, INC.
ENGINEERS-CONSTRUCTORS

TRAVERSE COMPUTATIONS

CALC. BY A.R.B. CHECKED BY L.S.R. DATE 11-3-52

PLANE COORDINATES - IVY CHM
1952 ADJUSTED HORIZONTAL CONTROL

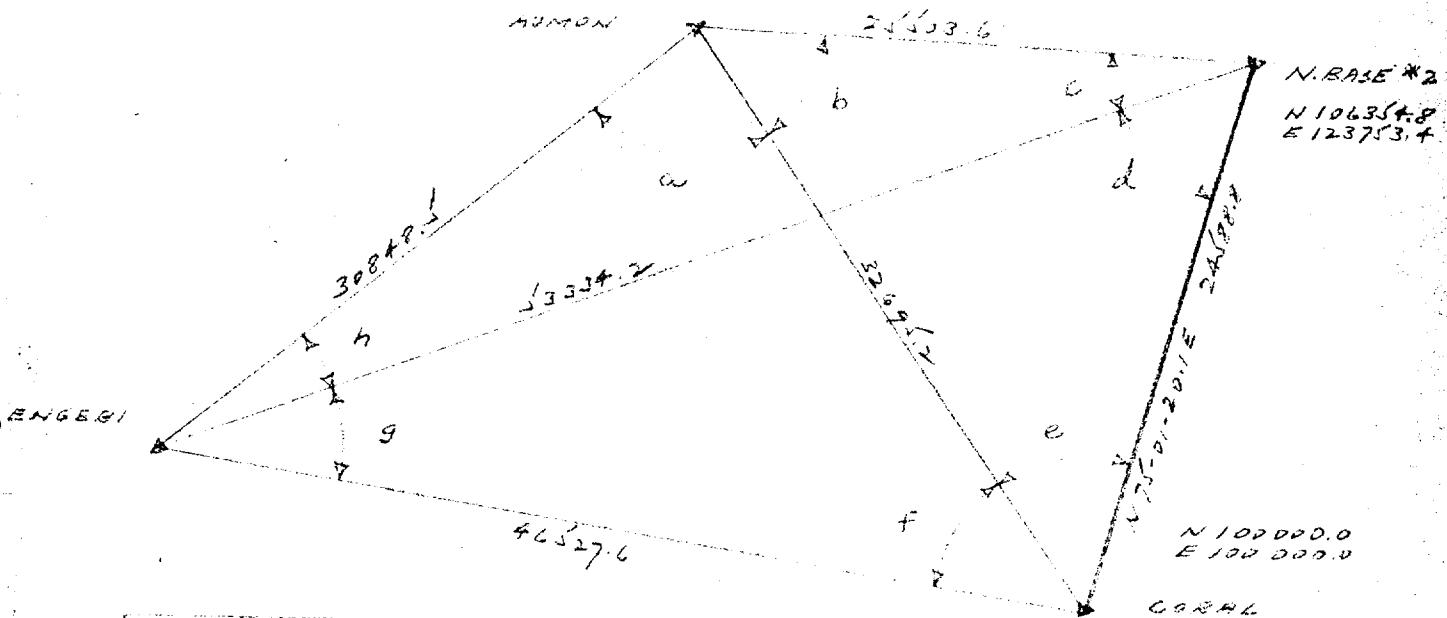
831 LOCATION Amon, Engebi

STATION	COURSE	DISTANCE	COBINE	SINE	LATITUDE		DEPARTURE		COORDINATES
					NORTH	SOUTH	EAST	WEST	
1 Coral	N 75-01-20.1E	24586.81	25844.392	96602.626	6354.828		23753.436		100,000.00
2 N. Base #2	N 23-30-33.7W	25503.65	91699.152	39889.979		23386.707		10173.401	106,354.83
3 Amon	N 61-21-31.8W	30848.50	47932.256	87763.881		14786.382		27073.811	129,741.54
4 Engebi	S 16-51-32.1E	46527.60	95702.136	29001.714		44527.907	13193.815	144,527.912	86,506.19
5 Coral									100,000.01
6									100,000.01
7									100,000.01
8 Coral	N 21-32-29.1E	32695.20	90966.667	44535.223	28744.538		13580.024		100,000.00
9 Amon									11,358.02
10									10
11									11
12 N. Base #2	N 44-17-48.1W	53334.23	71573.302	69837.390	38173.070		37247.229	106,354.83	123,753.44
13 Engebi								144,527.90	86,506.21
14									14
15									15
16									16
17									17
18									18
19									19
20									20
21									21
22									22
23									23
24									24
25									25
26									26
27									27
28									28
29									29
30									30

BY A.R.B. DATE July 1957
CHKD. BY [initials] DATE Nov. 1957

SUBJECT TRIANGULATION ADV.
1952 ADJUSTMENT

SHEET NO. 1 OF 1
JOB NO. 231
APTN. ENGBI



	DEG X	GEO. COND.	TRIG. COND.
a	94-05-50.5	388	185
b	48-03-03.6	040	036
c	20-47-14.0	143	139
d	60-40-51.5	518	521
e	50-28-49.9	502	507
f	41-24-01.4	017	021
g	27-26-14.7	150	154
h	17-03-43.9	442	437
		375	

Side Eq. $\sin a \cdot \sin c \cdot \sin e \cdot \sin g = 1$
 $\sin b \cdot \sin d \cdot \sin f \cdot \sin h$

Log Sin a 9.9488874 0.1
 a 9.1101036 555
 c 9.8872812 174
 g 9.6634959 425
 h 9.0997721 113

Log Sin a 9.8714212 18.9
 d 9.9404707 11.9
 f 9.8204113 23.9
 h 9.4674720 68.6
 g 9.0997722 123.3

2412.4
 Sin 48-03-03.6
 Sin 17-03-43.9

2412.4
 61
 236.8

3269.1.20
 Sin 41-24-01.4
 Sin 44-24-14.7

61/236.8 ± 0.26"

2412.4.20
 Sin 27-26-14.7
 Sin 50-28-49.9

2412.4.20
 142.527.17
 142.527.17

1334.2.3
 Sin 20-47-14.0
 Sin 17-03-43.9

COMPUTATION OF TRIANGLES

COMPUTED BY A.R.B.		CHECKED BY L.S.H.		DATE		12-11-51
STATION	OBSERVED ANGLE	CORR-N	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3					7494.68	3.8747531
1 Aomon	48-03-03.6	-0.3	03.3	0.0	03.3	0.1285794
2 North Base #2	81-28-05.5	+0.6	06.1	0.1	06.0	9.9951673
3 Coral	50-28-49.9	+0.8	50.7	0.0	50.7	9.8872858
I-3					9965.52	3.9984998
I-2					7773.53	3.8906183
2-3					9965.52	3.9984998
1 Engebi	44-29-58.6	+0.9	59.5	0.1	59.4	0.1543395
2 Aomon	94-05-58.5	+0.4	58.9	0.1	58.8	9.9988873
3 Coral	41-24-01.4	+0.4	01.8	0.0	01.8	9.8204106
I-3					14181.64	4.1517266
I-2					9402.64	3.9732499
2-3					7494.68	3.8747531
1 Engebi	27-26-14.7	+1.1	15.8	0.1	15.7	0.3365028
2 North Base #2	60-40-51.5	+0.4	51.9	0.1	51.8	9.9404704
3 Coral	91-52-51.3	+1.3	52.6	0.1	52.5	9.9997658
I-3					14181.63	4.1517263
I-2					16256.30	4.2110217
2-3					16256.31	4.2110217
1 Aomon	142-09-02.1	+0.1	02.2	0.1	02.1	0.2121229
2 North Base #2	20-47-14.0	+0.2	14.2	0.0	14.2	9.5501052
3 Engebi	17-03-43.9	-0.2	43.7	0.0	43.7	9.4674729
I-3					9402.64	3.9732498
I-2					7773.52	3.8906175

$\epsilon = 0.1$

HOLMES & HARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMPUTED BY A.R.B. DATE Feb. 1952

α'	2 North Base #2 to 3 Coral	75	02	07.9	α	3 Coral	to 2	North Base #2	255	01	20.1	
$2d\angle$	8	+ 81	28	06.1	$3d\angle$	8			- 50	28	50.7	
α	2 North Base #2 to 1 Aomon	156	30	14.0	α	3 Coral	to 1	Aomon	204	32	29.4	
$\Delta \alpha$				20.5	$\Delta \alpha$				+		27.4	
α'		180	00	00.0					180	00	00.0	
α'	1 Aomon	to 2	North Base #2	336	29	63.6	α'	1 Aomon	to 3 Coral	24	32	56.8

FIRST ANGLE OF TRIANGLE 48-03-03.3

ϕ	11	33	23.2672	North Base #2	2	λ	162	21	09.893	ϕ	11	32
$\Delta \phi$	+	03	52.016			$\Delta \lambda$	-	01	42.309	$\Delta \phi$	+	04
ϕ'	11	37	15.2831	Aomon		λ'	162	19	27.584	ϕ'	11	37
Logarithms										Logarithms	Values in seconds	
S	3.8906184					$\frac{1}{2}(\phi + \phi')$	11	36	19.276	S	3.9985000	$\frac{1}{2}(\phi + \phi')$
Cos α	9.9624106n					Logarithms				Cos α	9.9588794n	Logarithms
B	8.5124997					S	3.8906184			B	8.5124997	
h	2.3655287n	1st term	232.0218			sin α	9.6006319	+		h	2.4698791n	1st term
j^2	1	7.781				A'	8.5096669			j^2	7.997	
sin ² α	9.201					Sec ϕ'	0.0089948			sin ² α	9.237	
C	.717					- $\Delta \lambda$	2.0099120	+ 102.3086	C	.717		Sec ϕ'
7.699		2d term	+.0050			sin $\frac{1}{2}(\phi + \phi')$	9.3029466		7.951		2d term	- $\Delta \lambda$
h^2	4.73					- $\Delta \alpha$	1.3128585	+ 20.55	h^2	4.94		sin $\frac{1}{2}(\phi + \phi')$
U	1.98					D	1.98		D	1.98		- $\Delta \alpha$
6.71		3d term	+.0005						6.92	3d term	+.0008	- $\Delta \phi$
												- 295.0291

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HOLMES & HARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMPUTED BY		DATE											
α	2 Amon	\dagger 0 3 Coral	24	32	56.8	α	3	Coral	\dagger 0 2 Amon	204	32	29.4	
$\Delta \alpha$	2	118	94	05	58.9	$\Delta \alpha$	3	Coral	\dagger 0 2 Amon	204	32	29.4	
α'	1 Engеби	\dagger 0 1 Engеби	118	38	55.7	α	3	Coral	\dagger 0 1 Engеби	- 41	24	01.8	
$\Delta \alpha$	2	118	94	05	58.9	$\Delta \alpha$	3	Coral	\dagger 0 1 Engеби	163	08	27.6	
α'	1 Engеби	\dagger 0 2 Amon	298	38	00.7	α	1	Engеби	\dagger 0 3 Coral	-	-	27.3	
$\Delta \alpha$	2	298	00.0	00.0	00.0	$\Delta \alpha$	1	Engеби	\dagger 0 3 Coral	180	00	00.0	
α'	1 Engеби	\dagger 0 2 Amon	298	38	00.7	α	1	Engеби	\dagger 0 3 Coral	343	08	00.8	

HOLMES & NARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION

COMPUTED BY A.B.B. DATE Oct 1958

DATE FEE. 352.

SECOND ORDER TRIANGULATION

FIRST ANGLE OF TRIANGLE

CALC. BY A.R.B.

CHECKED BY L.S.H.

DATE 11-2-52

TRAVERSE COMPUTATIONS

PLANE COORDINATES - IVY GRID
1952 ADJUSTED HORIZONTAL CONTROL

JOB NO. 81 LOCATION Teitelr., Boga #1, Boga Rd #1

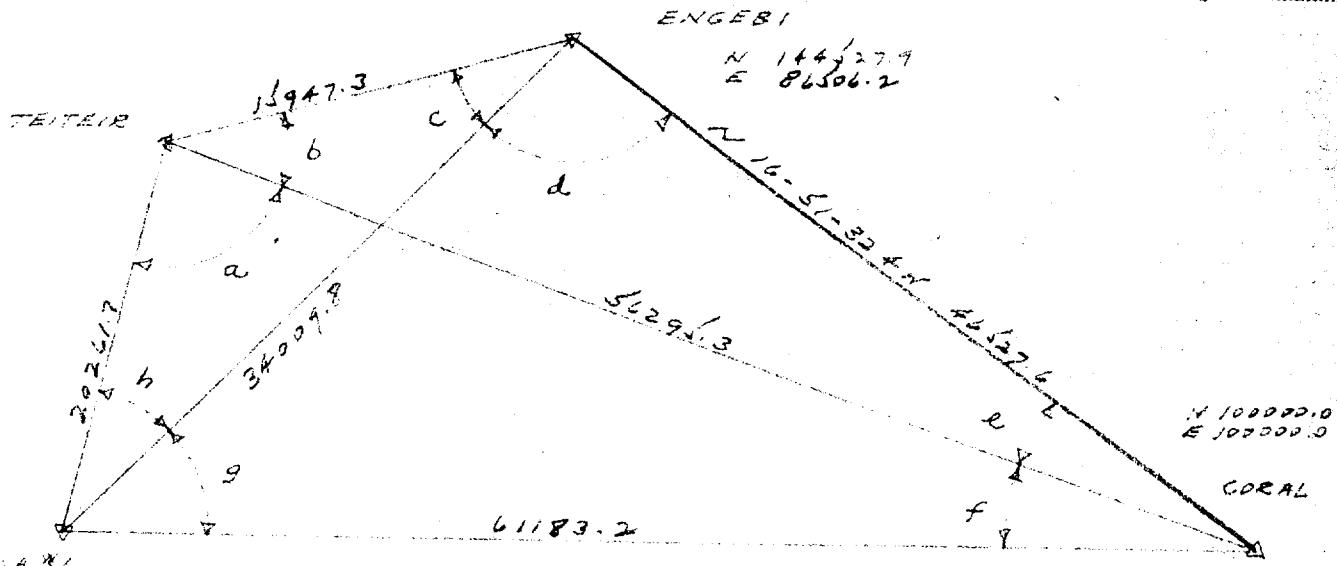
STATION	COURSE	DISTANCE	COSINE	SINE	LATITUDE	DEPARTURE	COORDINATES		
							NORTH	SOUTH	EAST
1 Coral	N 16-51-32.EW	95702136	.46527.60	.29001714	44527.907		13183.815	100,000.00	100,000.00
2 Engebi	N 76-30-01.EW	15947.35	.23344.065	.9723705	3722.760		114,527.91		86,506.18
3 Teitelr	S 63-03-18.EW	20261.69	.15313239	.8944.323	9181.5226		15506.711		70,999.44
4 Boga #1	S 50-18-07.EW	61166.32	.63871.096	.7691215	39062.134	47062.703	118,250.67		52,931.30
5 Coral							139,069.44		
6							100,000.00		100,000.00
7									100,000.00
8 Coral	N 31-00-27.EW	56285.31	.85709938	.51515110	48250.675	29000.591	114,527.91	100,000.00	100,000.00
9 Teitelr							118,250.67		70,999.44
10									100,000.00
11									100,000.00
12 Engebi	S 80-15-51.EW	31009.78	.16016709	.98703631	51568.471	33568.888	114,527.91	86,506.18	86,506.18
13 Boga #1							139,069.44		52,931.30
14									139,069.44
15 Boga #1	S 44-35-42.EW	193.62	.71208159	.70209368	131.874	135.939	138,931.57	52,931.30	52,931.30
16 Boga Rd #1									52,801.36
17									52,801.36
18 Coral	N 50-28-57.EW	61183.17	.63631200	.77113181	38931.585		100,000.00		100,000.00
19 Boga Rd #1	N 62-53-00.EW	20445.43	.45580311	.89008017	9319.097	10198.078	138,931.59	52,801.36	52,801.36
20 Teitelr							118,250.68		70,999.43
21									70,999.43
22 Boga Rd #1	N 80-34-21.EW	31456.27	.16179707	.9861946	5596.335	33704.822	138,931.57	52,801.36	52,801.36
23 Engebi							114,527.91	86,506.18	86,506.18
24									86,506.18
25									86,506.18
26									86,506.18
27									86,506.18
28									86,506.18
29									86,506.18
30									86,506.18

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BY A.C.B. DATE Feb 1948
CHKD. BY L.H. DATE Nov 1948

SUBJECT THE 1948 SURVEY OF A.O.I.
1942 ADJUSTMENT

SHEET NO. 1 OF 1
JOB NO. 831
TEITEIR, 130.6A #1



OKS.	GEO. COND.	TRIG. COND.
a	94-03-47.5	47.2
b	43-29-31.6	22.4
c	22-44-03.2	09.1
d	97-37-22.0	22.3
e	14-08-56.9	56.2
f	19-17-39.4	28.6
g	48-56-03.7	02.9
h	17-42-31.6	31.3
	00.0	

Side Eq	Log. Sin a	9.9989971	0.1	Log. Sin b	9.8131849	20.7
" "	C	9.5871308	50.2	d	9.9961449	2.8
" "	C	9.3881784	83.6	f	9.5190617	60.1
" "	g	9.8515614	18.3	h	9.4831273	15.9
		8.8515614	152.2		8.8515188	149.5
		5188.	199.1			
		436	301.7		436/301.7 = 1.4"	

<u>46527.6</u>	sin 23-26-34.8	sin 97-37-23.7
sin 48-56-03.5	(34009.78)	(61166.32)

<u>34024.72</u>	sin 22-44-07.7	sin 17-42-32.7
sin 139-33-19.0	(20261.69)	(15947.34)

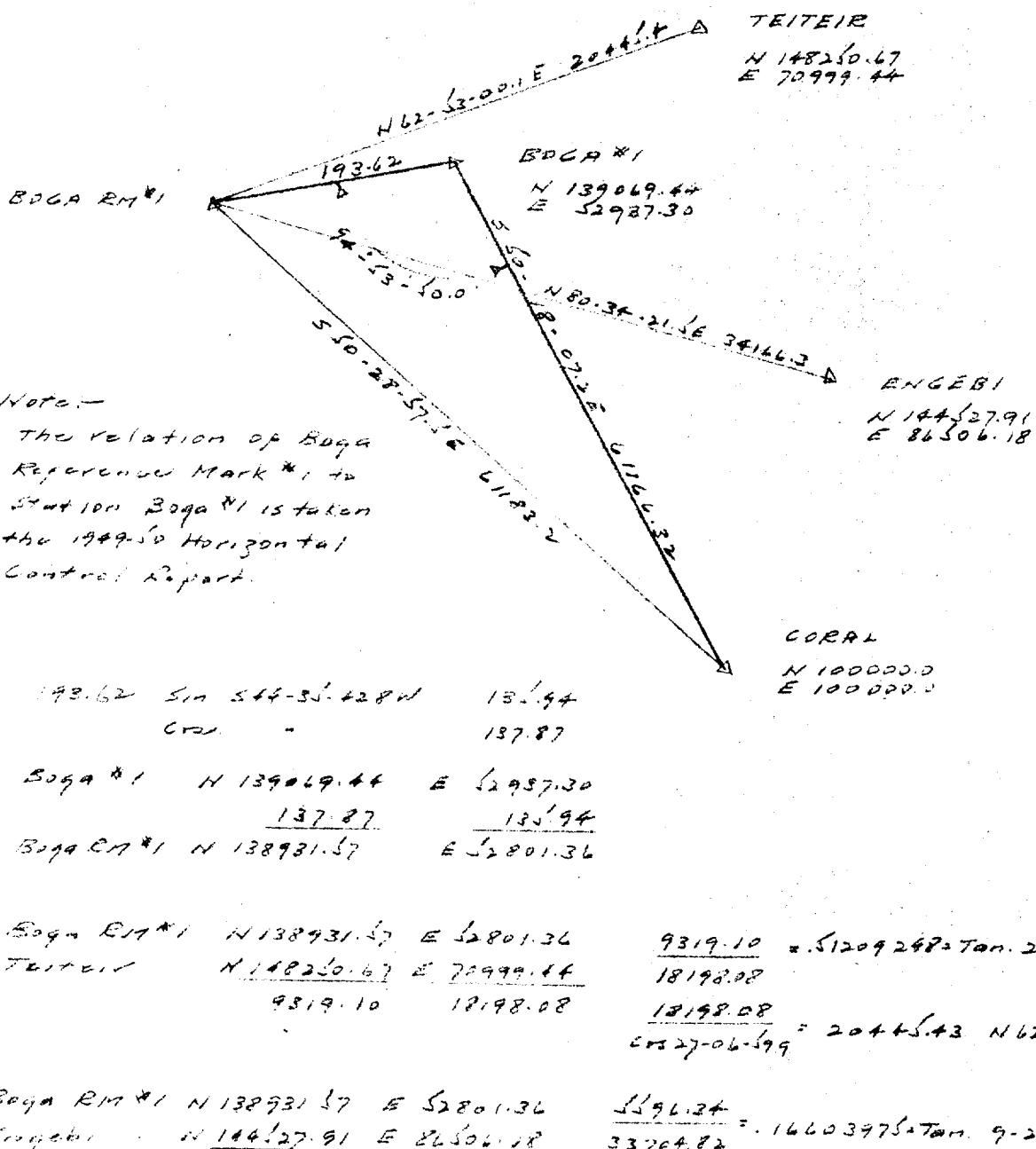
<u>46527.6</u>	sin 120-21-31.4	sin 14-08-56.8
sin 45-29-23.8	(56291.31)	(15947.39)

<u>56291.31</u>	sin 13-17-40.6	sin 94-03-45.8
sin 66-38-34.2	(20261.69)	(61166.35)

BY T.R.S DATE FEB 1947
CHKD. BY L.S.H DATE MAR 1947

SUBJECT TRIANGULATION ADJ.
1952 APPOINTMENT

SHEET NO. 1 OF 1
JOB NO. 831
BOGA PTN #1



Boga PTN #1 N 138931.57 E 52801.36 COR. 39-31-02.5	$\frac{33704.82}{6024.38} = 34166.27 \text{ N } 80-34-21.6E$
Boga PTN #1 N 138931.57 E 52801.36 COR. 39-31-02.5	$\frac{38931.57}{47198.64} = .8248451L \text{ Tan. } 39-31-02.5$
	$\frac{47198.64}{38931.57} = 61193.17 \text{ S } 50-28-47.5E$

COMPUTATION OF TRIANGLES

COMPUTED BY A.R.B. CHECKED BY L.S.H. DATE 12-11-51

STATION	OBSERVED ANGLE	CORR-N	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3					14181.64	4.1517266
1 Boga #1	48-56-03.7	-2.1	01.6	0.1	01.5	0.1226572
2 Engebi	97-37-22.0	+1.9	23.9	0.2	23.7	9.9961446
3 Coral	33-26-35.3	-0.4	34.9	0.1	34.8	9.7412361
I-3					18643.54	4.2705284
I-2					10366.21	4.0156199
2-3					14181.64	4.1517266
1 Teiteir	45-29-31.6	+2.2	33.8	0.0	33.8	0.1468121
2 Engebi	120-21-30.3	+1.2	31.5	0.1	31.4	9.9359494
3 Coral	14-08-55.9	-1.0	54.9	0.1	54.8	9.3881666
I-3					17158.85	4.2344881
I-2					4860.77	3.6867053
2-3					17158.85	4.2344881
1 Boga #1	66-38-35.3	-1.0	34.3	0.1	34.2	0.0371330
2 Teiteir	94-03-47.5	-1.6	45.9	0.1	45.8	9.9989073
3 Coral	19-17-39.4	+0.7	40.1	0.1	40.0	9.5190701
I-3					18643.54	4.2705284
I-2					6175.77	3.7906912
2-3					10366.21	4.0156199
1 Teiteir	139-33-19.1	+0.5	19.6	0.0	19.6	0.1379481
2 Engebi	22-44-08.3	-0.6	07.7	0.0	07.7	9.5871238
3 Boga #1	17-42-31.6	+1.1	32.7	0.0	32.7	9.4831365
I-3					6175.78	3.7906918
I-2					4860.76	3.6867045

COMPUTATION OF TRIANGLES

COMPUTED BY

A.R.B.

CHECKED BY L.S.H.

DATE

2-13-52

STATION	OBSERVED ANGLE	CORR-N	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3						4.1517267
1 Boga RM #1	48-56-	-	41.1	0.1	41.0	0.1225847
2 Engebi	97-25-	-	54.1	0.2	53.9	9.9963364
3 Coral	33-37-	-	25.2	0.1	25.1	9.7433021
1-3					18648.67	4.2706478
1-2					10403.90	4.0176135
NOTE - Refer to 1952 Expansion for new values						
2-3						
1						
2						
3						
1-3						
1-2						
2-3						
1						
2						
3						
1-3						
1-2						
2-3						
1						
2						
3						
1-3						
1-2						

$\epsilon = 0.2^{\text{m}}$

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMPUTED BY A.R.B. DATE Feb. 1952

α	2 Engebi	to 3 Coral	343	08	00.2	α	3 Coral	to 2 Engebi	163	08	27.6
$2d\angle$						$3d\angle$					
α	2 Engebi	to 1 Teiteir	103	29	31.7	α	3 Coral	to 1 Teiteir	148	59	32.7
$\Delta\alpha$			-		31.6	$\Delta\alpha$			-		68.7
α'	1 Teiteir	to 2 Engebi	283	29	00.0	α'	1 Teiteir	to 3 Coral	328	58	34.0

FIRST ANGLE OF TRIANGLE 45-29-33.8

ϕ	11 39 41.964 2	Engebi	λ	162	14	55.151	ϕ	11 32	20.264 3	Coral	λ
$\Delta\phi$	+ 36.898		$\Delta\lambda$	-	02	36.060	$\Delta\phi$	+ 07	58.808		$\Delta\lambda$
ϕ'	11 40 18.862 1	Teiteir	λ'	162	12	19.091	ϕ'	11 40	18.862 1	Teiteir	λ'
Logarithms	Values in seconds						Logarithms	Values in seconds			
5 3.6867054		$\frac{1}{2}(\phi + \phi')$	11 40 00.413	s	4.2344881		$\frac{1}{2}(\phi + \phi')$	11 36 19.558			
$\cos \alpha$ 9.3679379	n					$\cos \alpha$ 9.9330310					
B 8.5124960		s	3.6867054			B 8.5124997					
h 1.5671393	1st term - 36.9096	$\sin \alpha$	9.9878457 +			h 2.6800188	1st term - 478.6500	$\sin \alpha$ 9.7119349 +			
g^2 7.373		A'	8.5096664			s^2 8.469					
$\sin^2 \alpha$ 9.976		$\sec \phi'$	0.0090744			$\sin^2 \alpha$ 9.424					
C .721		$\Delta \lambda$	2.1932919	+156.0601	C .717						
8.070	2 d term + .0118	$\sin \frac{1}{2}(\phi + \phi')$	9.3058231			8.610	2 d term + .0407	$\sin \frac{1}{2}(\phi + \phi')$ 9.3035650			
h^2 3.13		$-\Delta \alpha$	1.4991150	+ 31.56	h^2 5.36	D 1.98					
C 1.99						7.34	3 d term + .0022				
5.12	3 d term + .0000										
	- $\Delta \phi$ - 36.8978										

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HOLMES & MARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION

SECOND ORDER TRIANGULATION

COMPUTED BY L.S.H. DATE Nov. 1952.

α	2	Engebi	to 3. Coral	343	08	00.2	α	3 Coral	to 2	Engebi	163	08	27.6
$2d\angle$			8	+ 97	37	23.9	$3d\angle$		8		- 33	26	34.9
α	2	Engebi	to 1 Boga #1	80	45	24.1	α	3 Coral	to 1	Boga #1	129	41	52.7
$\Delta \alpha$				- 1	08.2		$\Delta \alpha$				- 1	35.2	
α'	1	Boga #1	to 2 Engebi	260	44	16.9	α'	1 Boga #1	to 3 Coral	309	40	17.5	

FIRST ANGLE OF TRIANGLE 48-56-01.6

	11	39	41.9642	Engebi	λ	162	14	55.161	ϕ	11	32	20.254	3 Coral	λ	162	17	10.944	
$\Delta \phi$			54.247		$\Delta \lambda$	- 5	37.789	$\Delta \phi$		+ 6	27.463			$\Delta \lambda$	- 7	53.582		
ϕ'	11	38	47.7171	Boga #1	λ'	162	09	17.382	ϕ'	11	38	47.7171	Boga #1	λ'	162	09	17.362	
Logarithms																		
S	4.0156200				$\frac{1}{2}(\phi + \phi')$	11	39	14.840	s	4.2705281				$\frac{1}{2}(\phi + \phi')$	11	35	33.986	
Cos α	9.2058179				Logarithms	Values in seconds			Cos α	9.8053245				Logarithms	Values in seconds			
B	8.5124960								B	8.5124997								
Logarithms																		
S	4.0156200																	
Cos α	9.2058179																	
B	8.5124960																	
Logarithms																		
S	4.0156200																	
Cos α	9.2058179																	
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Cos α	9.2058179																	
B	8.5124960																	
Logarithms																		
S	4.0156200				</													

HOLMEST-B-WARF, INC.
ENGINEERS-CONSTRUCTORS

CALC. BY A.R.B.
CHECKED BY L.S.H.

DATE 11-4-52

TRAVERSE COMPUTATIONS

PLANE COORDINATES - IVY GRID
1952 ADJUSTED HORIZONTAL CONTROL

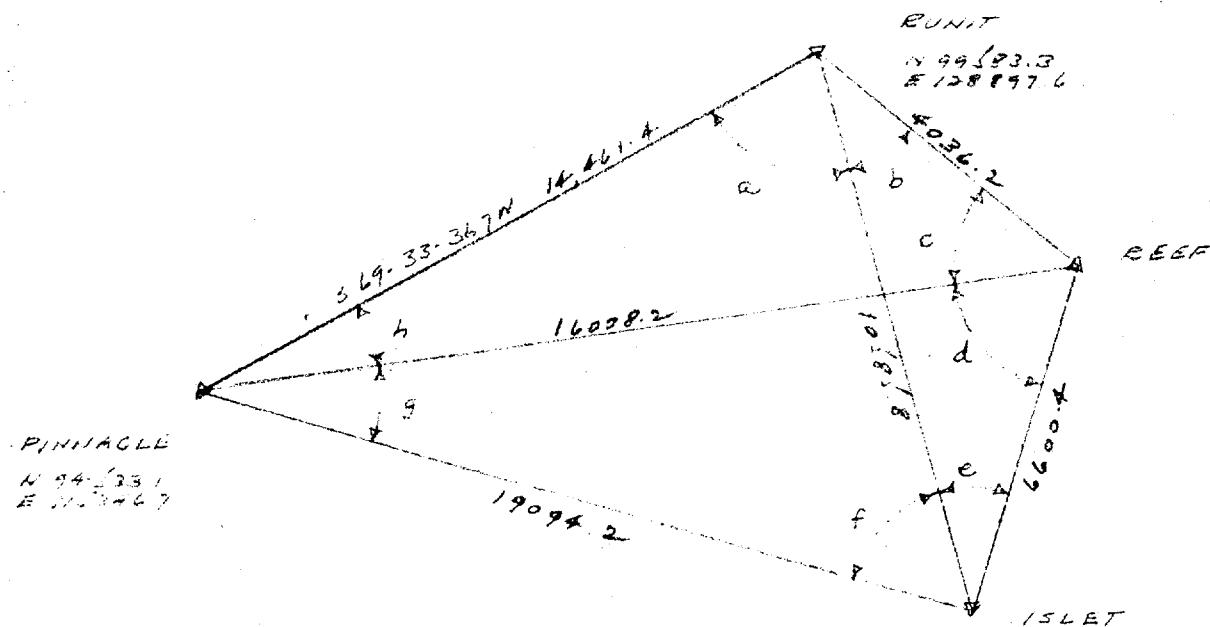
JOB NO. 831 LOCATION Islet, Reef

STATION	COURSE	DISTANCE	COSINE	SINE	LATITUDE	DEPARTURE		COORDINATE S	LOCATION	
						NORTH	SOUTH			
1 Runit	S 69°33'-16.7W	11461.36	30.922313	93703959	5056.211	13550.867	99583.31	128897.55		
2 Pinnacle	S 77°09'-18.8E	19091.23	22231053	97197591	1201.848	18635.114	91533.07	115346.68	2	
3 Islet	N 24°12'-14.3W	6600.36	91203205	44011893	6019.710		90288.22	133963.10	3	
4 Reef	N 35°45'-27.1W	4036.20	81119722	50435659	3215.365		2706.933	131256.16	4	
5 Runit						2358.579	96307.96	99583.33	128897.58	5
6										6
7										7
8 Pinnacle	N 63°38'-03.5E	16008.18	11087390	9938348	1774.889	15909.481	91533.07	115346.68	8	
9 Reef							98307.96	131256.16	9	
10										10
11										11
12 Runit	S 28°35'-19.2E	10585.76	87807370	17852116	9295.077	5065.510	99583.31	128897.55	12	
13 Islet							90288.23	133963.06	13	
14										14
15										15
16										16
17										17
18										18
19										19
20										20
21										21
22										22
23										23
24										24
25										25
26										26
27										27
28										28
29										29
30										30

BY A.R.B. DATE Mar. 1947
CHKD. BY A.S.H. DATE Mar. 1947

SUBJECT TRIANGULATION ADJ.
1947 ADJUSTMENT

SHEET NO. 1 OF 1
JOB NO. 231
REEF, ISLET



a 98-08-56.6
b 7-10-072
c 60-26-294
d 107-50-47.8
e 4-22-35.6
f 48-33-58.9
g 19-12-37.7
h 14-04-26.8
i 00.0

$$\text{Side Eq. } \frac{\sin a \cdot \sin c \cdot \sin e \cdot \sin g}{\sin b \cdot \sin d \cdot \sin f \cdot \sin h} = 1$$

$\log \sin a$	99931926	3.0	$\log \sin b$	9.0931821	1674
- - - c	99401596	11.9	- - - d	99781825	68
- - - e	98825874	275	- - - f	9.8745006	186
- - - g	9.5172477	60.4	- - - h	9.3857220	840
	8.3356873			8.3355870	

No correction

14901.4
Sin 20-36-294

Sin 105-19-03.8
(16008.18)

Sin 14-04-26.8
(4036.20)

16008.18
Sin 12-36-34.5

Sin 19-12-37.7
(6602.36)

Sin 107-50-47.8
(19094.23)

14461.4
Sin 82-33-52.9

Sin 35-17-04.5
(10181.76)

Sin 98-08-56.6
(9094.23)

10181.76
Sin 168-27-17.2

Sin 7-10-072
(6600.36)

Sin 4-22-35.6
(4036.20)

COMPUTATION OF TRIANGLES

COMPUTED BY A.R.B. CHECKED BY L.S.H. DATE 1-8-52

STATION	OBSERVED ANGLE	CORR-N	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3					4407.84	3.6442258
1 Islet	48-33-58.9	0.0	58.9	0.0	58.9	0.1250994
2 Pinnacle	33-17-04.5	0.0	04.5	0.0	04.5	9.7394124
3 Runit	98-08-56.6	0.0	56.6	0.0	56.6	9.9955926
I-3					3226.54	3.5087376
I-2					5819.93	3.7649177
2-3					4407.84	3.6442258
1 Reef	60-36-	-	29.4	0.0	29.4	0.0598404
2 Pinnacle	14-04-	-	26.8	0.0	26.8	9.3859220
3 Runit	105-19-	-	03.8	0.0	03.8	9.9842913
I-3					1230.24	3.0899882
I-2					4879.29	3.6883575
2-3					4879.29	3.6883575
1 Islet	52-56-	-	34.5	0.0	34.5	0.0979778
2 Pinnacle	19-12-	-	37.7	0.0	37.7	9.5172477
3 Reef	107-50-	-	47.8	0.0	47.8	9.9785825
I-3					2011.79	3.3035830
I-2					5819.93	3.7649178
2-3					3226.54	3.5087376
1 Reef	168-27-	-	17.2	0.0	17.2	0.6986633
2 Islet	4-22-	-	35.6	0.0	35.6	8.8825874
3 Runit	7-10-	-	07.2	0.0	07.2	9.0961821
I-3					1230.24	3.0899883
I-2					2011.79	3.3035830

HOLMES & MARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMPUTED BY A.R.B. DATE Feb. 1952

		FIRST ANGLE OF TRIANGLE 168-27-17.2				SECOND ORDER TRIANGULATION			
		°	'	"		°	'	"	
α	2 Islet	103	Runit		151	25	48.5		α 3 Runit 102 Islet 351 25 38.3
β					8	4	22	35.6	β 3 8 - 7 10 07.2
α	2 Islet	101	Reef		155	48	24.1		α 3 Runit 101 Reef 324 15 31.1
$\Delta \alpha$						-	50.4		$\Delta \alpha$ 04.7
α'	1 Reef	102	Islet		180	00	00.0		α' 1 Reef 103 Runit 180 00 00.0
ϕ	11 30 43.856	2	Islet		162	22	52.543		ϕ 11 32 16.080 3 Runit 162 22 01.621
$\Delta \phi$	+ 59.725				$\Delta \lambda$	-	27.208		$\Delta \phi$ 11 32 32.499 16.080 162 22 01.621
ϕ'	11 31 43.581	1	Reef		λ'	162	22	25.335	ϕ' 11 31 43.581 1 Reef 162 22 25.335
Logarithms	Values in seconds				Logarithms	Values in seconds			Logarithms Values in seconds
s	3.3035815				$\frac{1}{2}(\phi + \phi')$	11 31 13.718			$\frac{1}{2}(\phi + \phi')$ 11 31 59.830
$\cos \alpha$	9.9600749	n			Logarithms	Values in seconds			Logarithms Values in seconds
b	8.5125005				s	3.3035815			s 3.0899868
h	1.7761569	1st term	-59.7251	"	sin α	9.6125894+			$\cos \alpha$ 9.9093753+
β^2	6.807				A'	8.5096679			B 8.5124997
$\sin^2 \alpha$	9.225				Sec φ'	0.0088517			h 1.5118618
C	.716				$\Delta \lambda$	1.4346905	+27.2076	"	1st term +32.4984
β^2	6.548	2d term	+.0004		C	.717			sin α 9.7665075n
H ²	3.55								A' 8.5096679
D	1.98								Sec φ' 0.0088517
	5.53	3d term	+.0000						$\Delta \lambda$ -1.3750139 -23.7145
		-Δφ	-59.7247						$\sin \frac{1}{2}(\phi + \phi')$ 9.3008935
									$\cos \frac{1}{2}(\phi + \phi')$ 9.3008935
									-Δα 0.6759074 -4.74
									D 1.98
									5.00 3d term + .0000
									-Δφ +32.4987

HOLMES & HARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMPUTED BY A.R.B. DATE Feb. 1952

α	2 Pinnacle	to 3 Runit	249	34	07.6	α	3 Runit	α	2 Pinnacle	429	69	34	34.9
$\Delta \alpha$			+ 33	17	04.6	$3d\angle$		8		- 98	08	56.6	
α	2 Pinnacle	to 1 Islet	282	51	12.1	α	3 Runit	α	1 Islet	331	25	38.3	
$\Delta \alpha$					$\Delta \alpha$					+	10.2		
α	1 Islet		180	00	00.0					180	00	00.0	
α	1 Islet	to 2 Pinnacle	102	51	49.7	α'	1 Islet	α	3 Runit	151	25	48.5	"
α													

FIRST ANGLE OF TRIANGLE 48-33-58.9

ϕ	11.31	26.0102	Pinnacle	λ	162	19	45.307	ϕ	11	32	16.080	3 Runit	λ
$\Delta \phi$	- 42.164			$\Delta \lambda$	+ 03	07	23.6	$\Delta \phi$	- 01	32.224			$\Delta \lambda$
ϕ'	11.30	43.856	1 Islet	λ'	162	22	52.543	ϕ'	11	30	43.856	1 Islet	λ'
Logarithms	Values in seconds							Logarithms	Values in seconds				
s	$\frac{1}{2}(\phi + \phi')$	11	31	04.933	s	3.5087363		s	3.5087363				
$\cos \alpha$	3.7649163				Logarithms	Values in seconds		$\cos \alpha$	9.9436989				
B	9.3472462				s	3.7649163		B	8.5124998				
h	8.5125002	1st term	+ 42.1369	$\sin \alpha$	9.9889790	n		h	1.9648350	1st term	+ 92.2221	$\sin \alpha$	9.6796762
s^2	7.530			A'	8.5096680	s^2	7.017	s^2	7.017			A'	8.5096680
$\sin^2 \alpha$	9.978			$\sec \phi'$	0.0088261	$\sin^2 \alpha$	9.359	$\sec \phi'$	0.0088261			$\sec \phi'$	0.0088261
C	.716			$-\Delta \lambda$	2.2723894	"	187.2360	C	.716			$-\Delta \lambda$	1.7069066
h^2	8.224	2d term	+ .0168	$\sin \frac{1}{2}(\phi + \phi')$	9.3003268	h^2	7.092	2d term	+ .0012	$\sin \frac{1}{2}(\phi + \phi')$	9.3005854	$-\Delta \alpha$	50.9221
D	3.25			$-\Delta \alpha$	1.5727162	-37.39	n^2	3.93					
E	1.98	3d term	+ .0000			D	1.98						
F	5.23			$-\Delta \phi$	+ 42.1537			5.91	3d term	+ .0001			

HOMES & NAVIE, INC.
ENGINEERS-CONSTRUCTORS

PLANE COORDINATES - IV GRID
1952 ADJUSTED HORIZONTAL CONTROL

TRAVERSE COMPUTATIONS

CALC BY A.R.B. DATE 11-5-52

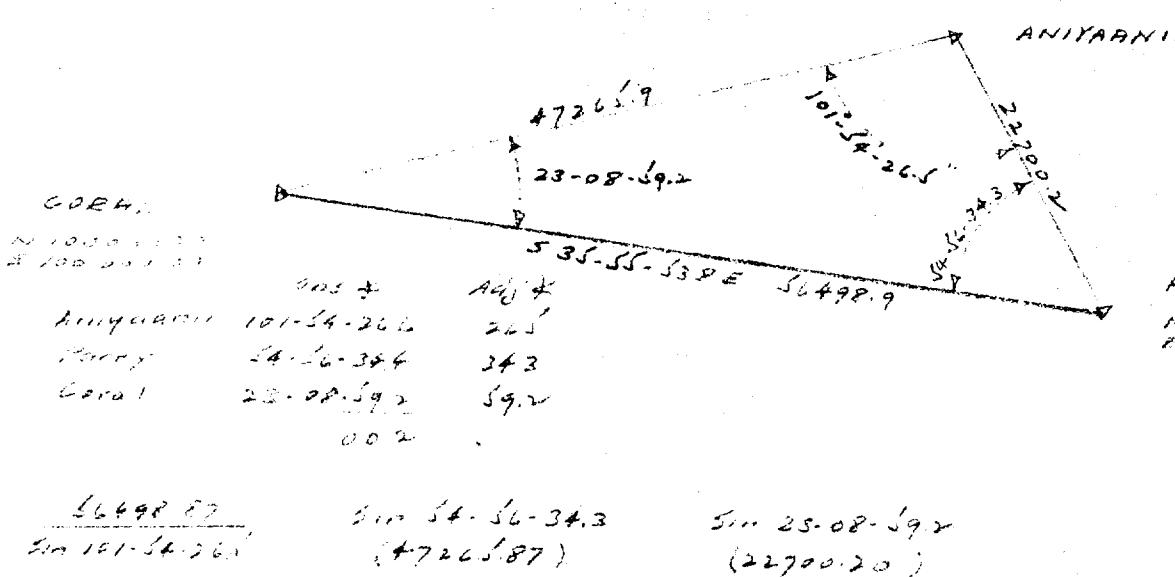
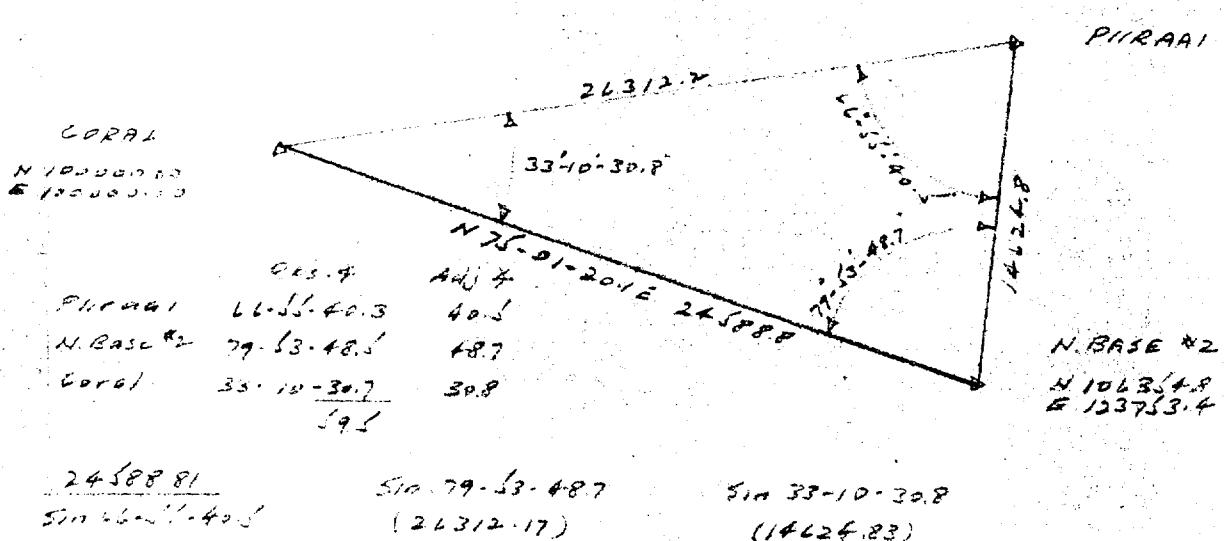
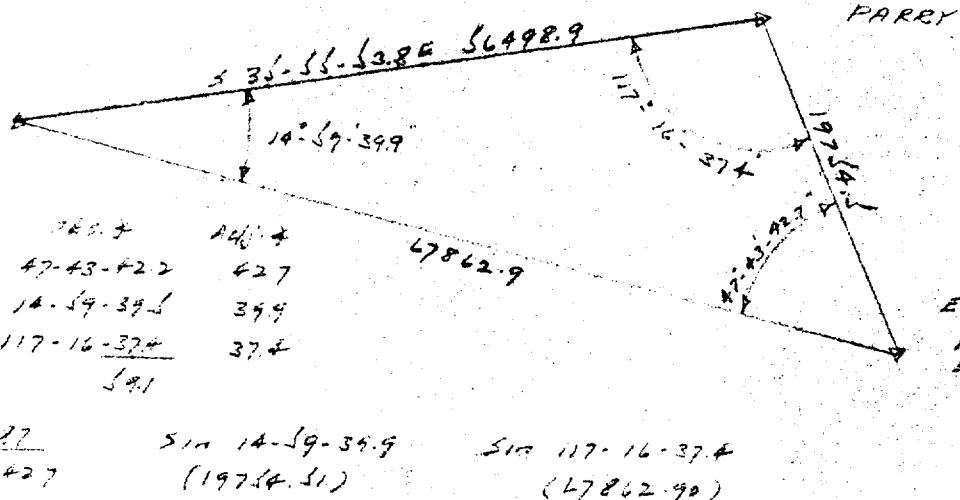
CHECKED BY I.S.H.

STATION	COURSE	DISTANCE	LATITUDE		DEPARTURE	
			SINE	COSINE	NORTH	EAST
1 Coral	S 35°55'53".8E	561.98.87	80971801	58681918	1570.853	33154.621
2 Party	S 26-47-28.W	19754.51	892651401	15071260	1763.913	8504.197
3 Eritrotok	N 20-56-13.9W	67862.90	93397269	35730.38	63382.095	24250.426
4 Coral						100,000.00
5						
6						
7						100,000.00
8 Coral	N 75-01-20.1E	21588.81	2584.392	96602626	6354.888	23753.436
9 N. Base #2	N 25-04-51.2W	11624.83	90571021	4289735	13215.858	17551.089
10 Piraa	S 11-50-49.3W	26312.17	71192867	6671112	19804.690	119,600.69
11 Coral						100,000.00
12						
13						
14						100,000.00
15 Coral	S 59-01-53.0E	47265.87	52381995	85709805	21286.117	10519.288
16 Aniyaani	S 19-00-40.5W	2270.20	94545163	32575380	21162.009	7394.676
17 Party						
18						
19						NOTE - Refer to 1952 Expansion for new values at Sta. Party,
20						Piraa and Eritrotok.
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						

JOB NO. 831 LOCATION Balmetok, Piraa, Aniyaani

COORDINATE S		COORDINATE E	
STATION	DEPARTURE	STATION	DEPARTURE
1 Coral	100,000.00	100,000.00	133,154.62
2 Party	54,251.85	54,251.85	124,250.42
3 Eritrotok	36,617.90	36,617.90	100,000.00
4 Coral	24250.426	24250.426	
5	100,000.00	100,000.00	
6			
7			
8	100,000.00	100,000.00	
9	106,354.83	106,354.83	123,753.44
10	17551.089	17551.089	117,554.01
11	119,600.69	119,600.69	100,000.00
12	100,000.00	100,000.00	
13			
14			
15	100,000.00	100,000.00	
16	110,549.30	110,549.30	
17	133,154.62	133,154.62	
18			
19			
20			
21			
22			
23			
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27			
28			
29			
30			

BY ARB DATE 10/15/47 SUBJECT TRINAGULATION ADV SHEET NO. 1 OF 1
CHKD. BY LSH DATE 10/15/47 1952 ADJUSTMENT JOB NO. 831
ENIWEATOR, PIRRAAI, ANIYABANII



COMPUTATION OF TRIANGLES

COMPUTED BY A.R.B. CHECKED BY L.S.H. DATE 1-8-52

STATION	OBSERVED ANGLE	CORR-N	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3					17220.89	4.2360559
1 Eniwetok	47-43-42.2	+ 0.5	42.7	0.0	42.7	0.1307882
2 Coral	14-59-39.5	+ 0.5	40.0	0.1	39.9	9.4126382
3 Parry	117-16-37.4	+ 0.1	37.5	0.1	37.4	9.9488045
I-3					6021.19	3.7796823
I-2					20684.67	4.3156486
NOTE -	Refer to 1952 Expansion for new values					
2-3					7494.68	3.8747530
1 Piiraai	66-55-40.3	+ 0.2	40.5	0.0	40.5	0.0362062
2 North Base #2	79-53-48.5	+ 0.3	48.8	0.1	48.7	9.9932129
3 Coral	33-10-30.7	+ 0.1	30.8	0.0	30.8	9.7381472
I-3					8019.96	3.9041721
I-2					4457.65	3.6491064
NOTE -	Refer to 1952 Expansion for new values					
2-3					17220.89	4.2360559
1 Aniyaanii	101-54-26.6	0.0	26.6	0.1	26.5	0.0094470
2 Parry	54-56-34.4	0.0	34.4	0.1	34.3	9.9130610
3 Coral	23-08-59.2	0.0	59.2	0.0	59.2	9.5945429
I-3					14406.68	4.1585639
I-2					6919.04	3.8400458
2-3						
1						
2						
3						
I-3						
I-2						

HOLMES & NARVER, INC.
ENGINEERS-CONSTRUCTORS
Pacific Southwest Region

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMPUTED BY A.R.B. DATE Feb. 1952.

α	2	Coral	to 3 Parry	324	04	06.3	α	3 Parry	to 2 Coral	144	06	12.6
$\Delta \alpha$				+ 14	59	40.0	$3^d 2'$			- 117	16	37.5
α	2	Coral	to 1 Eniwetok	339	03	46.3	α	3 Parry	to 1 Eniwetok	26	48	35.1
$\Delta \alpha$				+ 180	00	00.0	$\Delta \alpha$			-		17.7
α'	1	Eniwetok	to 2 Coral	159	04	34.7	α'	1 Eniwetok	to 3 Parry	206	48	17.4

FIRST ANGLE OF TRIANGLE 47-43-42.7

ϕ	11	32	20.254	2 Coral	λ	162	17	10.944	ϕ	11	24	46.373	3 Parry	λ	162	22	44.295
$\Delta \phi$	-	10	28.788		$\Delta \lambda$	+ 04	03.782	$\Delta \phi$	-	02	54.907		$\Delta \lambda$	-	01	29.569	
ϕ'	11	21	51.466	1 Eniwetok	λ'	162	21	14.726	ϕ'	11	21	51.466	1 Eniwetok	λ'	162	21	14.726
Logarithms	4.3156477	9.9703343+	8.65124997	2.7984817	1st term	628.7554	Sin α	9.5530869	Logarithms	2.2427976	1st term	+174.9031	Sin α	9.6542049+			
Cos α	8.631	8.106	7.717			A'	8.5096695		Values in seconds	7.669		A'	8.5096695				
$\sin^2 \alpha$						Sec ϕ'	0.0086993			Sec ϕ'		0.0085993					
$\sin^2 \alpha$						$\Delta \lambda$	2.3870024	-243.7828		$\Delta \lambda$		1.9521552	+89.5685				
$\sin^2 \alpha$						C	.712		Values in seconds	7.579	2d term	.0038	$\sin \frac{1}{2}(\phi+\phi')$	9.2954837			
$\sin^2 \alpha$						D	1.98			D		- $\Delta \alpha$	1.2476389	+17.69			
$\sin^2 \alpha$						E	6.47		Logarithms	6.47	3d term	.0003					
$\sin^2 \alpha$						F	1.98		Values in seconds	7.58	3d term	+ .0038	- $\Delta \phi$	+ 628.7877			

HOLMES & MARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMMITED BY A.B.B. DATE Feb: 1952

DATE ISSUED

FIRST ANGLE OF TRIANGLE 66-65-40; 6

HOLMES & HARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMPUTED BY A.R.B. DATE Feb. 1952.

α	2 Parry	to 3 Coral	144	05	12° 06'	α	3 Coral	to 2 Parry	324	04	06.3
$\Delta \alpha$		8	+ 54	66	34.4	$\Delta \alpha$	3d L	8	- 23	08	59.2
α	2 Parry	to 1 Anuyaani	199	01	47.0	α	3 Coral	to 1 Anuyaani	300	55	07.1
$\Delta \alpha$			+ 14.6			$\Delta \alpha$			+ 01	21.3	
α'	Anuyaani	to 2 Parry	19	02	01.8	α'	Anuyaani	to 3 Coral	120	66	28.4

FIRST ANGLE OF TRIANGLE 101-54-26.6

ϕ	11 24 46.373 2	Parry	162	22	44.296	ϕ	11	32	20.254	3 Coral	λ	162	17	10.944
$\Delta \phi$	+ 03 32.680		$\Delta \lambda$	+ 01	14.435	$\Delta \phi$	-	04	01.001		$\Delta \lambda$	+ 06	47.786	
ϕ'	11 28 19.253 1	Anuyaani	162	23	58.730	ϕ'	11	28	19.253	1 Anuyaani	λ'	162	23	58.730
α														
Logarithms	3.8400452	Values in seconds	$\frac{1}{2}(\phi + \phi')$	11 26 32.813	s	4.1685632	Logarithms	Cos α	9.7108113+		$\frac{1}{2}(\phi + \phi')$	11 30 19.754		
β	9.9765924		Logarithms	Values in seconds			Logarithms	Cos α	9.7108113+		Logarithms	Values in seconds		
γ	8.5126035		S	3.8400452			B	8.5124997			S	4.1685632		
α	2.3261411		Sin α	9.5132957	m		λ	2.3818742 +	1st term	+240.9207	Sin α	9.9334356		
β	7.680		α'	A'			S^2	8.317			A'	8.5096684		
γ	9.027		8.6096684				Sec α'	0.0087642			Sec ϕ'	0.0087642		
α	.712		0.0087642				$\sin^2 \alpha$	9.867			$-\Delta \lambda$	2.6104319 -407.7856		
β	7.419		- $\Delta \lambda$	1.8717735	-74.4344	C	.717							
γ	4.66		.0026	Sin $\frac{1}{2}(\phi + \phi')$	9.2975056		8.901	2d term	+ .0796 Sin $\frac{1}{2}(\phi + \phi')$	9.2998597				
α	1.98		1.1692791	-14.77			λ^2	4.76			$-\Delta \alpha$	1.9102911 -81.34		
β	6.64		6.74				D	1.98						
γ	- $\Delta \phi$		3d term	+ .0004							- $\Delta \phi$	+ 241.0008		
			- $\Delta \phi$	- 212.8800										

HOLMES & NAWROT INC.
ENGINEERS-CONTRACTORS

TRAVERSE COMPUTATIONS

CALC. BY A.B.B. CHECKED BY L.S.H. DATE 11-5-52

Bokon, Kirkinian

PLANE COORDINATES - IV GRID
1952 ADJUSTED HORIZONTAL CONTROL

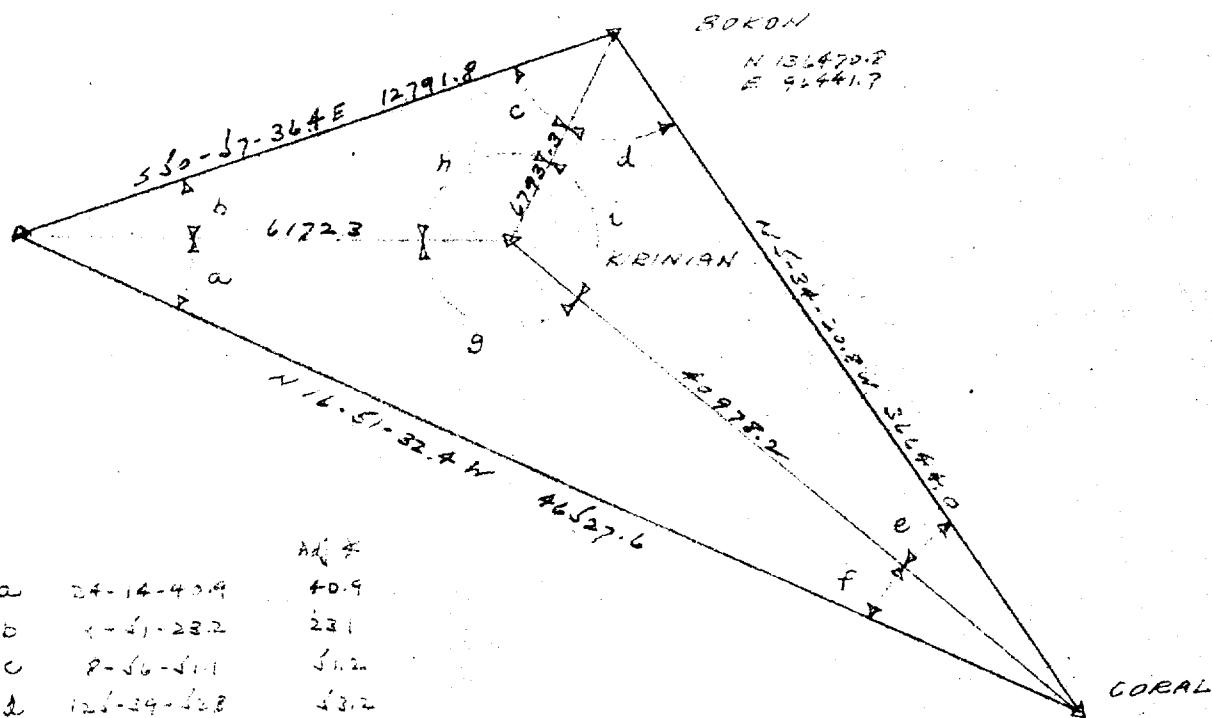
JOB NO. 831 LOCATION Bokon, Kirkinian

STATION	COURSE	DISTANCE	LATITUDE NORTH SOUTH	DEPARTURE EAST WEST		COORDINATES EAST SOUTH	WEST
				SINE	COSINE		
1 Coral	N 5-31-20.8W	36644.00	995274.21	097104.25	36170.828	3558.288	100,000.00
2 Bokon	S 68-33-45.8E	18112.10	3654824.7	930818.23	6729.300	17138.318	136,470.88
3 Amon							129,711.52
4							113,580.03
5							100,000.00
6 Bokon	N 50-57-36.1W	12791.84	6298612.8	7767076.4	8057.085	9935.520	136,470.83
7 Regebi							96,441.71
8							86,506.19
9							80,563.99
10							70,527.91
11							60,590.00
12 Coral	N 13-18-46.5W	40978.18	9731269.9	23026912.	39876.973	9136.009	100,000.00
13 Kirkinian	S 59-54-21.6E	6793.34	5033999	86521852	3406.11	5877.724	139,876.97
14 Bokon							136,470.83
15							96,441.71
16							86,506.18
17 Kirkinian	N 11-06-13.3W	6172.29	75352100	65742384	1650.950	4057.811	90,563.99
18 Regebi							80,563.92
19							70,527.92
20							60,590.00
21							50,553.99
22							40,563.99
23							30,533.99
24							20,503.99
25							10,473.99
26							0,443.99
27							-10,473.99
28							-20,503.99
29							-30,533.99
30							-40,563.99

BY AEB DATE Mar 13, 1961
CHKD. BY LSH DATE Mar 13, 1961

SUBJECT TIGUANGGALAT ISLAND PLAN
1962 ADJUSTMENT

SHEET NO. 1 OF 1
JOB NO. 831
KIRINIAN



Adj. #

P	24-14-40.9	40.9
O	2-51-23.2	23.2
C	2-56-51.1	51.1
L	126-29-52.8	52.8
E	7-44-23.0	23.0
F	2-42-45.9	45.9
G	12-12-33.2	33.2
H	161-11-40.7	40.7
I	46-35-41.1	41.1

$$\frac{\text{Side } EG}{\text{Side } OI} = \frac{\sin a \cdot \sin c \cdot \sin g}{\sin b \cdot \sin d \cdot \sin f}$$

Log sin a	9.6184553	46.8	Log sin t	9.2334323	121.2
" " C	9.1918151	133.7	" " d	9.9097924	15.2
" " E	9.1293229	154.9	" " f	9.7913490	340.0
	7.9345933	325.4		7.9345937	476.4
				9.33	333.4
				4	811.8

No correction.

36544.0
Sin 46-25-41.1

Sin 126-29-52.8
(40978.18)

Sin 7-44-23.0
(6793.34)

46527.60
Sin 12-12-33.2

Sin 24-14-40.9
(40978.17)

Sin 2-42-45.9
(672.29)

12791.84
Sin 161-11-40.7

Sin 9-51-23.1
(6793.33)

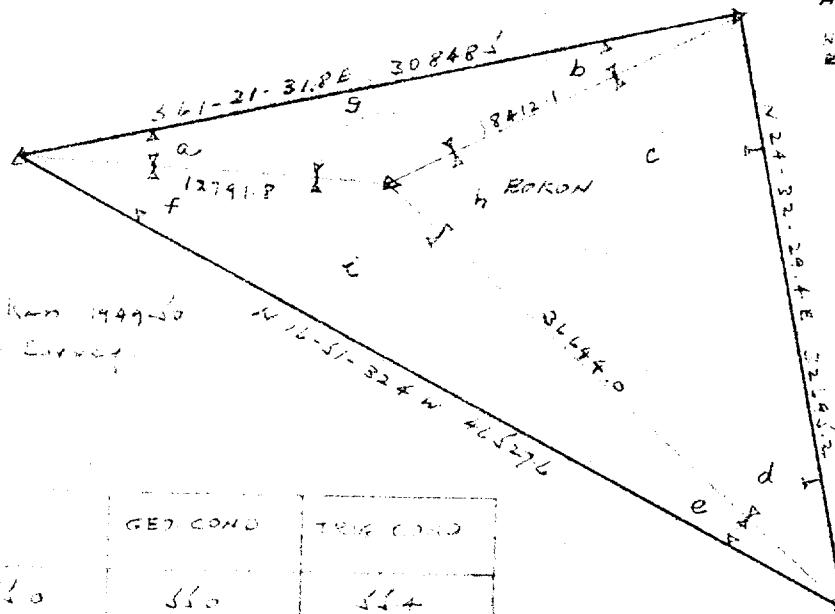
Sin 2-56-51.2
(672.28)

BY A.R.B. DATE May 1954
CHKD. BY L.S.H. DATE Nov 1954

SUBJECT TRIMMING POINTS, B.C.N.
1942 ADJUSTMENT

SHEET NO. 1 OF 1
JOB NO. 731
B.C.N.

POINT 1
N 144°27'4"
E 81°56'2"



	GEO. COND.	TRUE COND.
a	12-23-54.0	54.0
b	7-12-14.4	14.4
c	26-63-44.1	44.1
d	30-26-50.7	50.7
e	11-17-10.7	10.7
f	34-05-04.1	04.1
g	129-19-59.0	00.0
h	122-23-50.9	50.9
i	12-43-34.7	34.7
j	34-36-43.9	43.9
k	129-19-59.5	00.0

CORR.
N 100 000.0
E 100 000.0

$$\text{Side Eq. } \frac{\sin a \cdot \sin c \cdot \sin e}{\sin f \cdot \sin b \cdot \sin d} = 1$$

$$\begin{aligned} \log \sin a &= 9.2564619 & 114.8 \\ \log \sin c &= 9.9993621 & 1.0 \\ \log \sin e &= 9.29-2.82 & 104.4 \\ & 8.5674487 & 22.3 \end{aligned}$$

$$\begin{aligned} \log \sin f &= 9.7482470 & 27.1 \\ \log \sin b &= 9.0483062 & 126.4 \\ \log \sin d &= 9.2004640 & 36.3 \\ & 8.5674672 & 233.9 \\ & 9483 & 221.3 \\ & 189 & 455.2 \end{aligned}$$

$$\begin{aligned} \sin 12-23-54.0 &= 0.47420 \\ \sin 7-12-14.4 &= 0.2129-26.0 \end{aligned}$$

$$\begin{aligned} \sin 26-63-44.1 &= 0.64-64.0 \\ \sin 30-26-50.7 &= 0.64-44.0 \end{aligned}$$

$$\begin{aligned} \sin 11-17-10.7 &= 0.92-32-10.2 \\ \sin 129-19-59.0 &= 0.184-2-0.9 \end{aligned}$$

$$\begin{aligned} \sin 12-43-34.7 &= 0.34-27-20 \\ \sin 34-36-43.9 &= 0.34-36-44.0 \end{aligned}$$

$$\begin{aligned} \sin 12-23-54.0 &= 0.47420 \\ \sin 7-12-14.4 &= 0.2129-26.0 \end{aligned}$$

$$\begin{aligned} \sin 34-36-43.9 &= 0.34-43.99 \\ \sin 129-19-59.5 &= 0.184-2-0.9 \end{aligned}$$

$$\begin{aligned} \sin 12-23-54.0 &= 0.47420 \\ \sin 7-12-14.4 &= 0.2129-26.0 \end{aligned}$$

$$\begin{aligned} \sin 26-63-44.0 &= 0.64-64.0 \\ \sin 30-26-50.7 &= 0.64-44.0 \end{aligned}$$

$$\begin{aligned} \sin 11-17-10.7 &= 0.92-32-10.2 \\ \sin 129-19-59.0 &= 0.184-2-0.9 \end{aligned}$$

COMPUTATION OF TRIANGLES

COMPUTED BY A.R.B. CHECKED BY L.S.H. DATE 2-12-52

STATION	OBSERVED ANGLE	CORR-N	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3						3.9985000
1 Bokon	62-59-24.7	+ 0.3	25.0	0.0	25.0	0.0501566
2 Aomon	86-53-44.1	+ 0.8	44.9	0.1	44.8	9.9993623
3 Coral	30-06-50.7	- 0.5	50.2	0.0	50.2	9.7004625
I-3					11169.12	4.0480189
I-2					5612.02	3.7491191
2-3						3.5909476
1 Kirinian	161-11-	-	45.7	0.0	45.7	0.4916974
2 Engebi	9-51-	-	23.1	0.0	23.1	9.2334533
3 Bokon	8-56-	-	51.2	0.0	51.2	9.1918151
I-3					2070.61	3.3160983
I-2					1861.33	3.2744601
2-3						
1						
2						
3						
I-3						
I-2						
2-3						
1						
2						
3						
I-3						
I-2						

$\epsilon = 0.1$

HOLMES & NARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMPUTED BY A.R.B. DATE Feb. 1952.

α	2 Aomon	to 3 Coral	24	32	56.8	α	3 Coral	to 2 Aomon	204	32	29.4
$\epsilon d \angle$			+ 86	53	44.9	$3d\angle$			- 30	06	50.2
α	2 Aomon	to 1 Bokon	111	26	41.7	α	3 Coral	to 1 Bokon	174	25	39.2
$\Delta \alpha$			-		34.8	$\Delta \alpha$			-	07.2	
α'	Bokon	to 2 Aomon	291	26	06.9	α'	1 Bokon	to 3 Coral	354	25	37.0

FIRST ANGLE OF TRIANGLE 62-59-25.0

Logarithms Values in seconds			Logarithms Values in seconds			Logarithms Values in seconds			Logarithms Values in seconds		
ϕ	11 37 15.283 2	Aomon	λ	162	19	27.584	ϕ	11 32 20.254 3	Coral	λ	162 17 10.944
$\Delta \phi$	+ 01 06.763		$\Delta \lambda$	-	02	52.446	$\Delta \phi$	+ 06 01.792		$\Delta \lambda$	- 35.805
ϕ'	11 38 22.046 1	Bokon	λ'	162	16	35.139	ϕ'	11 38 22.046 1	Bokon	λ'	162 16 35.139
s	3.7491191		s	3.7491191			s	4.0460189		s	4.0480189
$\cos \alpha$	9.5630140n		$\sin \alpha$	9.9688421 +			$\cos \alpha$	9.9979427 n		$\sin \alpha$	9.9872382 +
b	8.5124972		h	2.5564613	1st term	361.7939	b	8.6124997		a'	8.5096667
h	1.8246303	1st term	-66.7775	$\sin \alpha$	9.9688421 +		$\sin^2 \alpha$	7.974		$\sec \phi'$	0.0090237
j^2	7.498			a'	8.5096667		$\sin^2 \alpha$	8.096		$\Delta \lambda$	1.5539475 + 35.8063
$\sin^2 \alpha$	9.938			$\sec \phi'$	0.0090237		c	.717	2d term	$\cdot 00006 \sin^{\frac{1}{2}}(\phi+\phi')$	9.3029657
c	.720			$\Delta \lambda$	2.2366516	+172.4454		6.787		$-\Delta \alpha$.8569132 + 7.13
n^2	8.0156	2d term	+ .0143	$\sin^{\frac{1}{2}}(\phi+\phi')$	9.3044775		d	5.12			
b	3.65			$-\Delta \alpha$	1.6411291	+ 34.76	d	1.98	3d term	+ .0013	
b	1.99						e	7.10		$-\Delta \phi$	- 361.7920
b	5.64	3d term	+ .0000								- 66.7632

HOLMES & MARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION - SECOND ORDER TRIANGULATION

COMPUTED BY A.R.B. DATE Feb. 1952.

α	2	Engebi	to 3	Bokon	309	01	56.1	α	3	Bokon	to 2	Engabi	129	02	16.3
$\angle \angle$		8			+ 9	51	23.1	$3d\angle$		8			- 8	56	51.2
α	2	Engebi	to 1	Kirinian	318	53	19.2	α	3	Bokon	to 1	Kirinian	120	05	26.1
$\Delta \alpha$					+ 8.3			$\Delta \alpha$					-	11.9	
α'	1	Kirinian	to 2	Engabi	138	53	27.5	α'	1	Kirinian	to 3	Bokon	300	05	13.2

FIRST ANGLE OF TRIANGLE 181-11-45.7

ϕ	11	39	41.964	2	Engabi	162	14	56.151	ϕ	11	38	22.046	3	Bokon	λ	162	16	35.139
$\Delta \phi$	-	46.133			$\Delta \lambda$	+ 40.840	$\Delta \phi$	+ 38.785						$\Delta \lambda$	-		69.148	
ϕ'	11	38	55.831	1	Kirinian	162	15	35.991	ϕ'	11	38	66.831	1	Kirinian	λ'	162	15	35.991
Logarithms									Logarithms	Values in seconds								
$\frac{1}{2}(\phi + \phi')$		11	39	18.898	S	3.3160962			$\frac{1}{2}(\phi + \phi')$		11	38	38.938					
Logarithms					Logarithms	Values in seconds			Logarithms	Values in seconds								
						Cos α 9.70015352												
						B 8.5124966												
						S 3.2744627												
							Sin α 9.81791162											
							A 8.50966666											
							Sec ϕ' 0.0090384											
							$\Delta \lambda$ 1.6110793	- 40.8394	C	• 721								
							2 d term + .0008	9.3063995		7.227	2 d term	+ • 0017	$\sin \frac{1}{2}(\phi + \phi')$ 9.3049914					
							$\Delta \alpha$ • 9164788	- 8.25	n^2	3.06								
									D	1.99								
										5.06	3 d term	+ .0000						
											- $\Delta \phi$	46.1329						

HOLMES & MAYER, INC.
ENGINEERS-CONTRACTORS

PLANE COORDINATES - IVY GRID
1952 ADJUSTED HORIZONTAL CONTROL

TRAVERSE COMPUTATIONS

CALC. BY A.R.B. CHECKED BY L.S.H. DATE 11-6-52

STATION	COURSE	DISTANCE	COSINE	SINE	LATITUDE		DEPARTURE		COORDINATES	
					NORTH	SOUTH	EAST	WEST	NORTH	SOUTH
1										
2	Eugibi	N 67-15-44.18	11981.79	3865124.	9222811.9	4631.111			114527.90	
3	Bogen	S 78-28-42.27	1547.76	19973153	9798491.3				11050.615	86506.19
4	Teteair								119159.01	75155.58
5									148550.65	70999.05
6										
7										
8	Eugibi	S 0-09-30.68	40713.33	99999617	* 00276634	40713.171			114527.90	86506.19
9	Photo	N 16-21-31.08	37567.31	69011219	72367351	25926.797			103814.73	86593.36
10	Aamon								129741.52	113520.03
11										
12										
13	Photo	N 43-30-02.57	48802.65	72536603	68846337	35254.711			103114.73	86593.56
14	Bo. #1								136669.11	52937.28
15										
16										
17	Eugibi	S 34-23-41.38	2660.39	82516472	56449220	2195.260	1502.834		114527.90	86506.19
18	PI #1 Marin	N 44-31-03.08	6760.20	74817457	66350193	5057.810			1142332.65	88009.02
19	E Zerb								114851.06	83533.62
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										

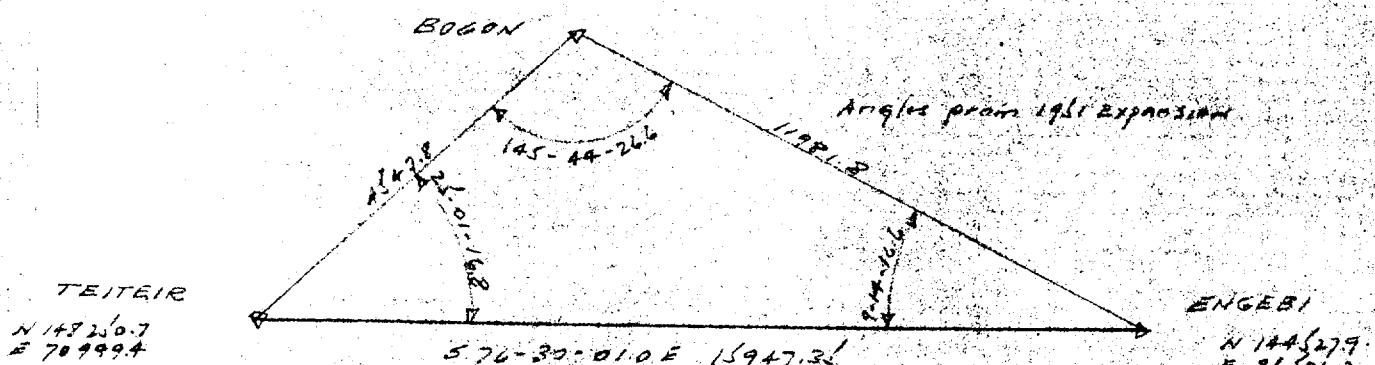
BY AKL DATE Oct 1957
CHKD. BY E.H. DATE Nov 1957

SUBJECT T.R.I. TRIANGULATION ADJ.
1951 ADJUSTED

SHEET NO. 1 OF 1

JOB NO. 831

BOGON, PHAID



15947.36
Sin 145-44-26.6

sin 25-01-16.8
(11984.79)

sin 9-14-16.6
(+547.76)

BOGA X1
N 139 06' 9.4
E 52 937.3

N 80-45-51.3 E 34009.8

ENGEBI

N 144 52' 9.7

E 86 506.2

ADONIN
N 119 20' 0.7
E 117 554.0

PHOTO

$$\frac{30848.5 \text{ Sin } d}{34009.8 \text{ Sin } a \text{ Sin } c} = 1$$

$$\log \sin d \quad 9.9782954 \quad 6.8$$

$$- \log \sin f \quad 9.8390769 \quad 22.1$$

$$- 30848.5 \quad 4.4892340$$

$$+ 3072063$$

$$\log \sin a \quad 9.9172150 \quad 16.3$$

$$- \log \sin e \quad 9.8383968 \quad 20.2$$

$$- 34009.8 \quad 4.5216041$$

$$+ 3072159$$

$$63.4$$

$$63$$

$$96$$

$$96143.4 = 015"$$

	GEO. COND.	TRIG. COND.
a	55-44-07.7	07.7
b	80-36-19.5	20.7
c	61-31-01.1	02.9
d	76-16-55.7	55.7
e	46-12 - } NOT f	01.9
f	48-39 - } MEAS.	31.9

$$- 30848.5$$

$$+ 3072063$$

$$- 34009.8$$

$$+ 3072159$$

$$63$$

$$96$$

$$\frac{34009.8}{\sin 46-12-00.4}$$

$$\sin 55-44-06.2$$

$$(40713.33)$$

$$\sin 80-36-20.7$$

$$(48602.65)$$

$$\frac{30848.5}{\sin 46-12-00.4}$$

$$\sin 61-31-02.4$$

$$(37567.31)$$

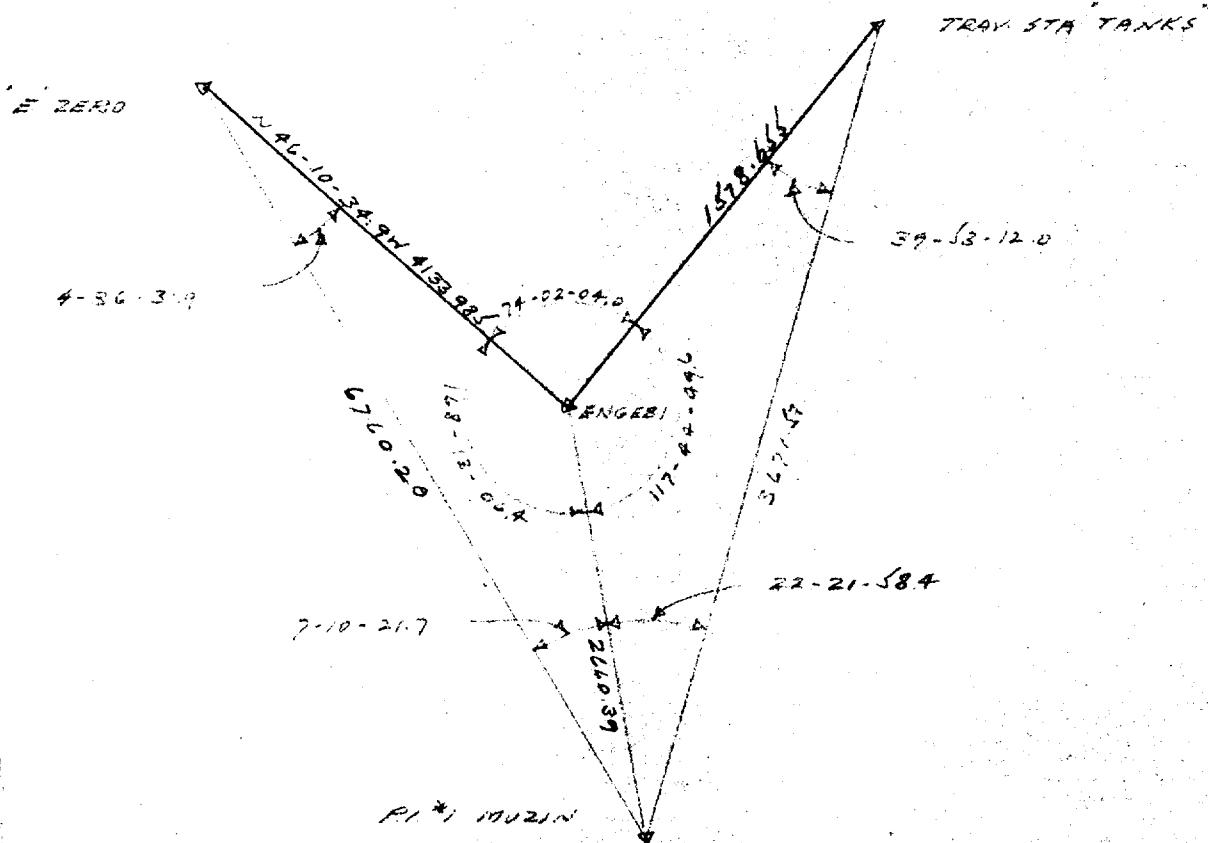
$$\sin 76-16-57.2$$

$$(40713.34)$$

BY A.R.B. DATE 10-8-76 SUBJECT TERRAIN LATERAL AND
CHKD. BY L.S.A. DATE 10-11-76

SHEET NO. 1 OF 1
JOB NO. 831
PL #1 17821N

NOTE - Basic data copied from E.S. 76



4133.985
Sim 7-10-21.7

Sim 4-36-31.9
(2660.40)

Sim 168-13-06.4
(3760.20)

1528.651
Sim 22-21-38.4

Sim 39-53-12.0
(2560.39)

Sim 117-44-49.6
(3671.57)

COMPUTATION OF TRIANGLES

COMPUTED BY A.R.B. CHECKED BY L.S.H. DATE 1-3-52

STATION	OBSERVED ANGLE	CORR-N	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3						3.6867033
1 Bogon	145-44-	-	26.6	0.0	26.6	0.2495389
2 Engebi	9-14-	-	16.6	0.0	16.6	9.2055694
3 Teiteir	25-01-	-	16.8	0.0	16.8	9.6262949
I-3					1386.15	3.1416116
I-2					3652.05	3.5625371
2-3						3.9732496
1 Photo	46-12-03.1	-2.6	00.5	0.1	00.4	0.1416063
2 Engebi	61-31-01.2	+1.4	02.5	0.1	02.4	9.9439698
3 Aomon	72-16-55.7	+1.6	57.3	0.1	57.2	9.9788964
I-3					11450.53	4.0588257
I-2					12409.44	4.0937523
2-3						4.0156200
1 Photo	43-39-32.8	+0.4	33.2	0.1	33.1	0.1609198
2 Boga #1	55-44-07.7	-1.4	06.3	0.1	06.2	9.9172129
3 Engebi	80-36-19.5	+1.3	20.8	0.1	20.7	9.9941361
I-3					12409.44	4.0937527
I-2					14814.12	4.1706759
2-3						3.1003843
1 Muzin	7-10-	-	21.7	0.0	21.7	0.9035753
2 E-Zero	4-36-	-	31.9	0.0	31.9	8.9049973
3 Engebi	168-13-	-	06.4	0.0	06.4	9.3100152
I-3					810.98	2.9089569
I-2					2060.51	3.3139748

BOGON

PHOTO

PHOTO

MUZIN

133

HOLMES & MARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMPUTED BY A.R.B. DATE Feb. 1952

α	2	Engebi	to 3 Teiteir	103	29	31.7	α	3 Teiteir	to 2 Engebi	'283	29	00.2
$2d\angle$		8		+ 9	14	16.6	$3d\angle$	8		- 25	01	16.8
α	2	Engebi	to 1 Bogen	112	43	48.3	α	3 Teiteir	to 1 Bogen	258	27	43.4
$\Delta\alpha'$				-		22.5	$\Delta\alpha$			+		09.1
α'	1	Bogen	to 2 Engebi	292	43	25.8	α'	1 Bogen	to 3 Teiteir	78	27	52.5

FIRST ANGLE OF TRIANGLE 146-44-26.8

ϕ	11	39	41.964	2 Engebi	λ	162	14	55.151	ϕ	11	40	18.862	3 Teiteir
$\Delta\phi$			+ 45.920		$\Delta\lambda$	- 01	51.217	$\Delta\phi$		+ 09.022		$\Delta\lambda$	+
ϕ'	11	40	27.884	1 Bogen	λ'	162	13	03.934	ϕ'	11	40	27.884	1 Bogen
S	3.6625392			Values in seconds					Logarithms	Values in seconds			
Cos α	9.5870268				$\frac{1}{2}(\phi + \phi')$	11	40	04.924	S	3.1418137			$\frac{1}{2}(\phi + \phi')$
B	8.5124960								Cos α	9.3010666			Logarithms
					S	3.5625382			B	8.5124956			Values in seconds
H	1.6620620	1st term	-45.9264		Sin α	9.9648888	+		H	0.9553759	1st term	-9.0235	Logarithms
g^2	7.125				A'	8.5096664			g^2	6.284			Values in seconds
$\text{Sin}^2 \alpha$	9.930				Sec ϕ'	0.0090784			$\text{Sin}^2 \alpha$	9.982			$\text{Sec } \phi'$
C	.721				$-\Delta\lambda$	2.0461728	+111.2174	"	C	.721			$-\Delta\lambda$
	7.776	2d term	+.0060		$\text{Sin}^{\frac{1}{2}}(\phi+\phi')$	9.3058691				6.987	2d term	+.0010	$\text{Sin}^{\frac{1}{2}}(\phi+\phi')$
h^2	3.32				$-\Delta\alpha$	1.3520419	+22.49		D	1.910			$g.3060572$
D	1.99	3d term	+.0000							3.90	3d term	+.0000	$-\Delta\alpha$
	5.31												-45.9204
													-9.0226

(34)

HOLMES & MARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION SECOND ORDER TRIANGULATION

DATE Nov. 1 1952

COMPUTED BY 4.0.2.U. DATE														
α	2	E-Zero	\rightarrow 3	Ergebnis	313	48	51.6	α	3 Ergebnis	\rightarrow 2	E-Zero	133	48	57.7
$2d\angle$			8		+ 4	36	31.9	$3d\angle$		8		- 168	13	06.4
α	2	E-Zero	\rightarrow 1	Muzin	318	25	23.5	α	3 Ergebnis	\rightarrow 1	Muzin	326	35	51.7
$\Delta \alpha$					+ 9.1			$\Delta \alpha$				34	24	08.7
α'	1	Muzin	\rightarrow 2	E-Zero	138	25	32.6	α'	1 Muzin	\rightarrow 3	Ergebnis	146	35	54.4
$\Delta \alpha$					180	0.0	00.0					180	0.0	00.0

FIRST ANGLE OF TRIANGLE 7-10-21.7

ϕ	11 40 10.366 2 B-Zero	λ	162 14 25.182	ϕ	11 39 41.964 3 Engedi	λ	162 14 55.161
$\Delta\phi$	- 50.167	$\Delta\lambda$	+ 45.145	$\Delta\phi$	- 21.775	$\Delta\lambda$	+ 15.126
ϕ'	11 39 20.189 1 Musin	λ'	162 16 10.277	ϕ'	11 39 20.189 1 Musin	λ'	262 16 10.277
Logarithms	Values in seconds	Logarithms	Values in seconds	Logarithms	Values in seconds	Logarithms	Values in seconds
s	$\frac{1}{2}(\phi + \phi')$	11 39 45.273	s	$\frac{1}{2}(\phi + \phi')$	11 39 31.076	Logarithms	Values in seconds
Cos α	3.3139747	Logarithms	Values in seconds	Cos α	2.9089619	Logarithms	Values in seconds
B	9.8739404	s	5.3139747	B	9.9165016	s	2.9089619
H	8.6124957	1st term	9.8219217	H	1.3379589	1st term	+21.7760
λ'	1.7004108	+50.1661	Sin α	λ'	8.6124956	+21.7760	Sin α
s^2	6.62795		A'	s^2	6.81792		A'
$\sin^2 \alpha$	9.64384		8.5096664	$\sin^2 \alpha$	9.50410		8.5096665
C	0.72170		Sec ϕ'	$\sin^2 \alpha$	0.0090489		Sec ϕ'
λ^2	6.99349	2d term	- $\Delta\lambda$	1.6546117	-45.1452	C	0.0090489
L	3.4008	+ 0.0010	$\sin^2(\phi + \phi')$	9.3056687	6.04406	0.72204	- $\Delta\lambda$
λ^2	1.9891		- $\Delta\alpha$	0.9602804	- 9.13	λ^2	1.1797272
λ^2	5.3899	3d term	$\sin^2(\phi + \phi')$	6.04406	2d term	D	-15.1261
		+ 0.0000	$\sin^2(\phi + \phi')$	9.3056687	+ 0.0001	1.9894	- $\Delta\alpha$
		- $\Delta\phi$	$\sin^2(\phi + \phi')$	9.3056687		4.6653	0.4852511
			$\sin^2(\phi + \phi')$	9.3056687			- 3.06
			$\sin^2(\phi + \phi')$	9.3056687			- $\Delta\phi$

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$\epsilon = 0.3$

HOLMES & HARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION

COMPUTED BY L.S.H. DATE Nov. 1952.

SECOND ORDER TRIANGULATION

α	2	Boga #1	to 3	Engobi	260	44	15.9	α	3	Engobi	to 2	Boga #1	80	45	24.1
$2d\angle$		8			+ 55	44	06.3	$3d\angle$		8			- 80	36	20.8
α	2	Boga #1	to 1	Photo	316	28	22.2	α	3	Engobi	to 1	Photo	0	09	03.3
$\Delta \alpha$					+ 1	07.7	$\Delta \alpha$						-	00.2	
α'	1	Photo	to 2	Boga #1	136	29	29.9	α'	1	Photo	to 3	Engobi	180	00	00.0
α'	1	Photo	to 2	Boga #1	136	29	29.9	α'	1	Photo	to 3	Engobi	180	09	03.1

FIRST ANGLE OF TRIANGLE 43-39-33.2

ϕ	11	38	47.7172	Boga #1	λ	162	08	17.362	ϕ	11	39	41.964	3	Engobi	λ	162	14	55.16	
$\Delta \phi$	- 5	49.629			$\Delta \lambda$	+	6	36.709	$\Delta \phi$	-	6	43.878			$\Delta \lambda$	-	01.07		
ϕ'	11	32	58.088	Photo	λ'	162	14	54.071	ϕ'	11	32	58.088	1	Photo	λ'	162	14	54.07	
S																			
$\frac{1}{2}(\phi + \phi')$	11	35	62.903	S	4.0937522				$\frac{1}{2}(\phi + \phi')$	11	36	20.02							
Cos α	9.8603667			Logarithms	Values in seconds				Cos α	9.9999985					Logarithms	Values in seconds			
B	B.5124964			S	4.1706762			B	8.5124960						S	4.0937522			
n	2.6436383	1st term	+ 349.5733	sin α	9.8380290			h	2.6062467	1st term	+ 403.8748	sin α							
s^2	8.34135	A'	8.5096668	s^2	8.18750										A'	B.5096666			
$sin^2 \alpha$	9.67606	Sec ϕ'	0.0088837	$sin^2 \alpha$	4.84121										Sec ϕ'	0.0088837			
C	D.72082	$-\Delta \lambda$	2.5272546	-336.7087	C	0.72139									$-\Delta \lambda$	0.0329052	-1.0787		
n ²	B.73823	2d term	+ 0.0547 sin $\frac{1}{2}(\phi + \phi')$	9.3032916		3.75010	2d term	+ 0.0000	sin $\frac{1}{2}(\phi + \phi')$	9.3035698									
n ²	5.0871	$-\Delta \alpha$	1.8305461	-67.69	n^2	5.2125									$-\Delta \alpha$	9.3364750	-0.22		
L	1.9884				D	1.9888													
7.0755	3d term	+ 0.0012				7.2013	3d term	+ 0.0016							$-\Delta \phi$	403.8764			

$\epsilon = 0.3$

HOLMES & MARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMPUTED BY A.R.B. DATE Feb. 1952.

α	2 Aomon	to 3 Engebi	118	38	66.7	α	3	to 2
$\Delta \alpha$		8	-72	16	57.3	$\Delta \alpha$	8	
α'	2 Aomon	to 1 Photo	46	21	58.4	α'	3	to 1
$\Delta \alpha'$		-	-	54.9	$\Delta \alpha'$			
α''	Photo	to 2 Aomon	226	21	03.6	α''	1	to 3
$\Delta \alpha''$		-	180	00	00.0	$\Delta \alpha''$	1	
α'''	Photo	to 1 Photo	180	00	00.0	α'''	1	0.00
$\Delta \alpha'''$		-	-	-	-	$\Delta \alpha'''$	-	0.00

FIRST ANGLE OF TRIANGLE

ϕ	11 37 15.283	2 Aomon	λ	162	19	27.584	ϕ	3	
$\Delta \phi$	- 04 17.196		$\Delta \lambda$	-	04	33.511	$\Delta \phi$		$\Delta \lambda$
ϕ'	11 32 58.087	Photo	λ'	162	14	54.078	ϕ'		λ'
$\Delta \phi'$									
Logarithms	Values in seconds								
$\frac{1}{2}(\phi + \phi')$	11 36 06.686	S							
	Logarithms	Values in Cos α							
4.0588262	+	B							
Cos α	9.8388783								
B	8.6124972								
$\sin \alpha$	2.4102017	1st term	+257.1590	Sin α	9.8595977				
$\sin^2 \alpha$				A'	8.5096676				
$\sin^3 \alpha$				Sec ϕ'	0.0088838				
C	.720			$\Delta \lambda$	2.4369753	+273.6113	C		
$\sin^4 \alpha$	8.557	2 d term	+.0361	$\sin^{\frac{1}{2}}(\phi+\phi')$	9.3028172				
$\sin^5 \alpha$	4.82			$\Delta \alpha$	1.7397926	+54.93	$\Delta \alpha$		
$\sin^6 \alpha$	1.99			D					
L	6.81	3d term	+.0006						
				$\Delta \phi$	+257.1957				

HOLMES & TRAVER INC.
ENGINEERS-CONSTRUCTORS

PLANE COORDINATES - IVY GRID
1952 ADJUSTED HORIZONTAL CONTROL

CALC BY L.B. CHECKED BY

DATE 11-6-52

TRAVERSE COMPUTATIONS

STATION	COURSE	DISTANCE	SINE	COSINE	LATITUDE		DEPARTURE		COORDINATES			
					NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
1 N. Base #2	S 37-15-22.1E	8505.84	.79638921	.60491612			6771.516	.6144.110	108354.85			123753.44
2 Runit	S 35-45-27.1E	4056.20	.81149722	.58435629			3271.586	.23568.579	98883.31			128897.56
3 Beef	N 36-06-15.3W	66.274	.81811284	.57656801	55.401				96307.96			131256.13
4 Los. M.	N 35-06-13.3W	18000.00	.81811284	.57506801	9017.362				8900.696			131218.59
5 C Zero	S 36-29-56.1E	76.00	.78261985	.62249984			58.696	.46.687	106178.70			124317.90
6 Old Zero	S 36-52-02.3E	164.305	.79898169	.60015820			151.428	.98.608	106120.01			124364.58
7 Trav. Sta. 7A	N 62-42-20.6E	798.645	.46866080	.89866303	568.227				105988.58			124465.19
8 N. Base #2									106364.81			123753.47
9												
10 N. Base #2	S 72-40-16.9E	591.268	.29786206	.96461204	176.110		564.430		106178.72			124317.87
11 C Zero												
12												
13												
14 Coral	N 19-10-16.3W	50172.36	.94454159	.322539101	417390.447				16476.389			123753.44
15 B Zero	S 46-10-34.9E	4135.385	.68244090	.72147460	2842.560				147390.45			835625.61
16 Engeli									144527.91			885601.18
17												
18 Amon	N 56-01-33.8W	4140.90	.55861583	.82899178	2324.000				123741.54			113580.03
19 V Zero									132066.54			110146.02
20												
21 Amon	S 56-01-37.5E	4565.70	.55980096	.82890180	2561.318				128741.54			113580.03
22 Jack	S 6-45-36.0E	2190.887	.98311624	.11713257	2175.806				127190.22			117366.57
23 Lucy	N 40-32-21.8W	6220.232	.76996831	.64997079	4727.125				126014.42			111623.00
24 Amon									1042.969			113580.03
25												
26 Lucy	N 46-45-10.3W	10270.472	.686666921	.72800746	7041.119				126014.42			117625.00
27 V Zero									7476.980			110146.02
28												
29												
30												

BY A.L.B. DATE NOV 1927
CHKD. BY L.S.M. DATE NOV 1927

SUBJECT TRINIDAD AND TOBAGO
1962 ADJUSTMENT

SHEET NO. 1 OF 1
JOB NO. 231
C ZERO, LOC M

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Pacific Southwest Region**

Pacific Southwest Region

N. Basc 2

104354.8
123753.4

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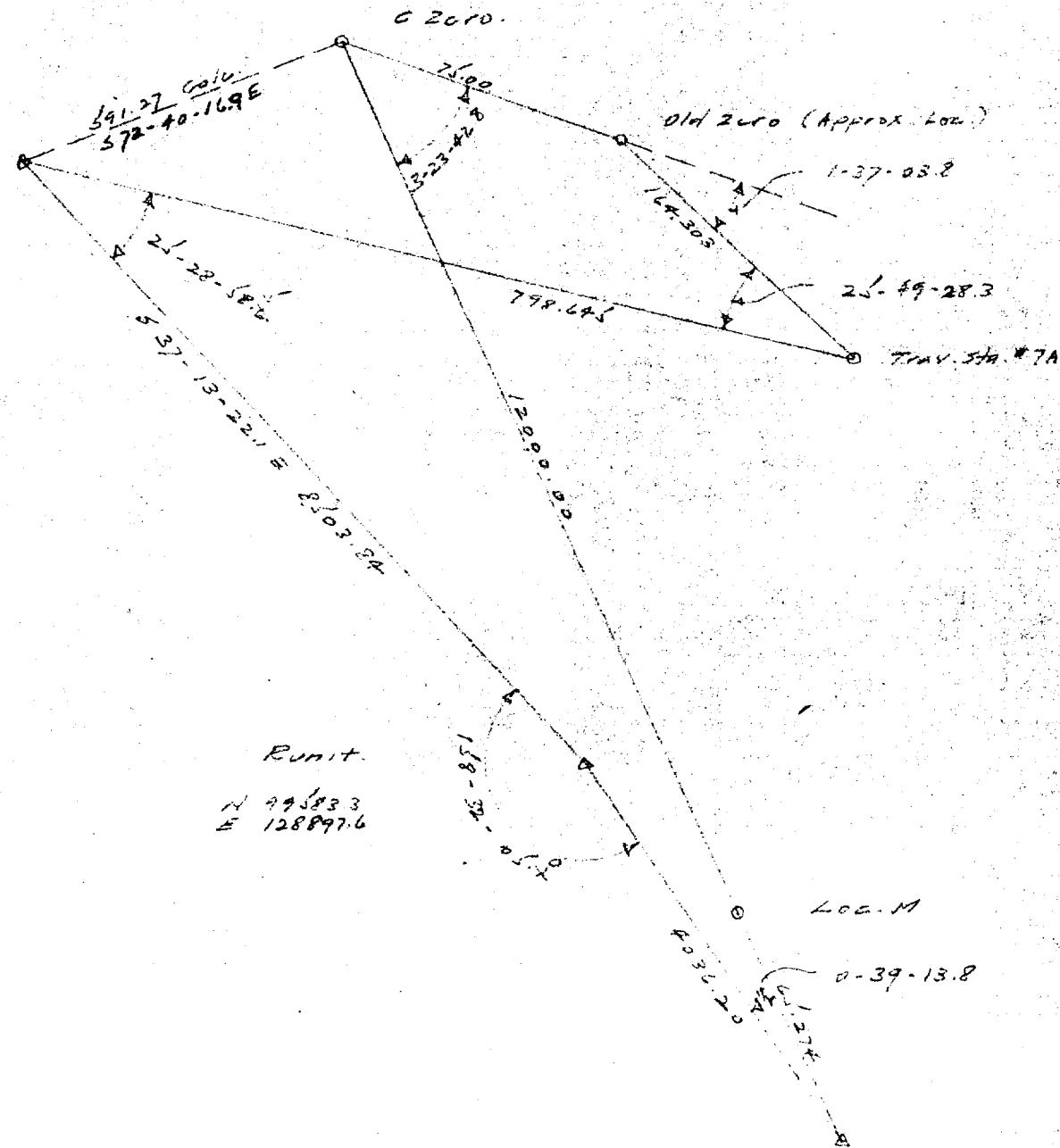
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E 128897.6

Note.—Basic data copied from F.S.R.74.



Rex.

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E 131256.2

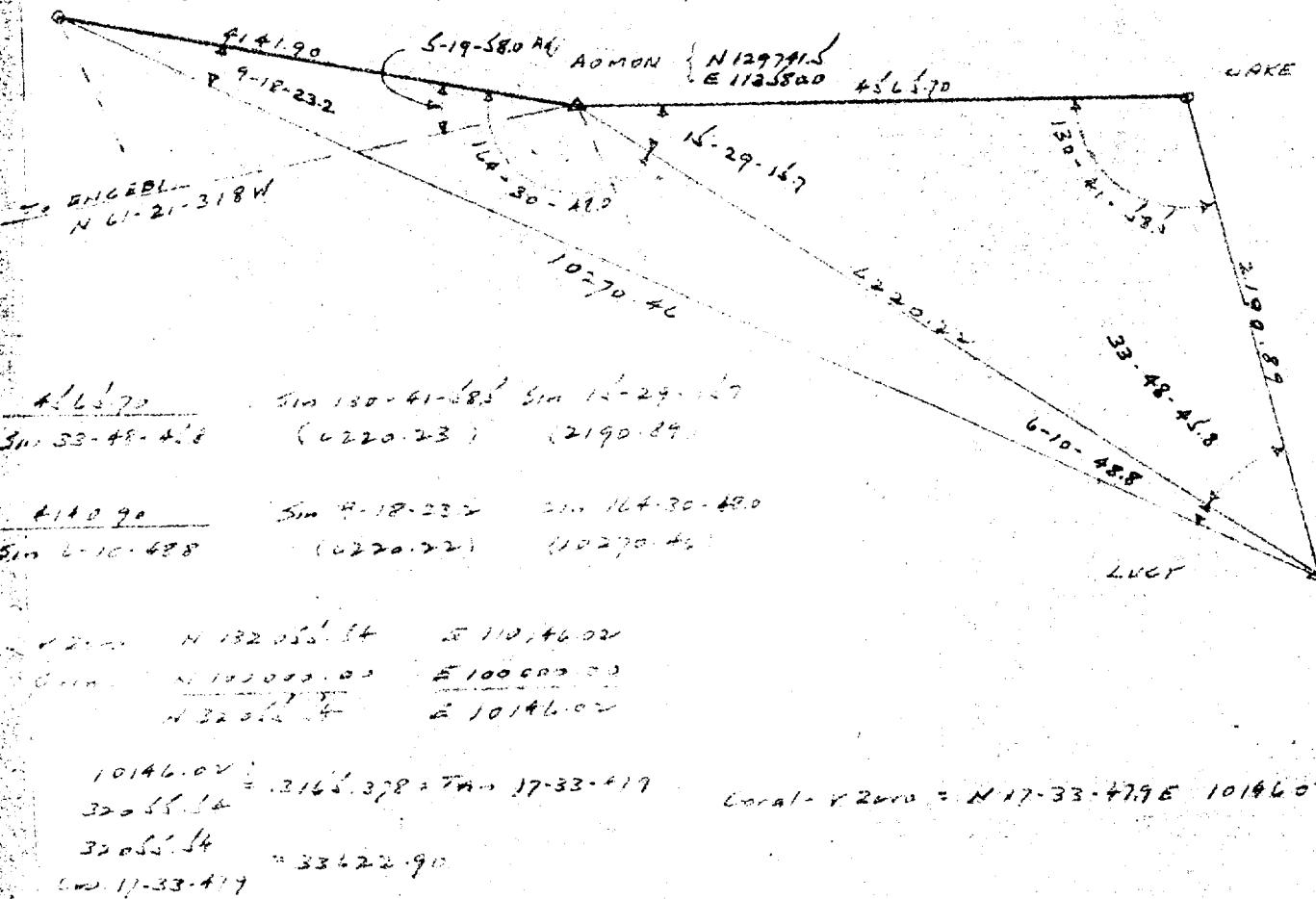
BY P.L.D. DATE March 1957
CHKD. BY L.S.H. DATE Nov. 1957

SUBJECT TROPICAL HURRICANE OF
1957 AUGUST 20TH.

SHEET NO. 1 OF 1
JOB NO. R-31
E 2000, V 2000, LUCY

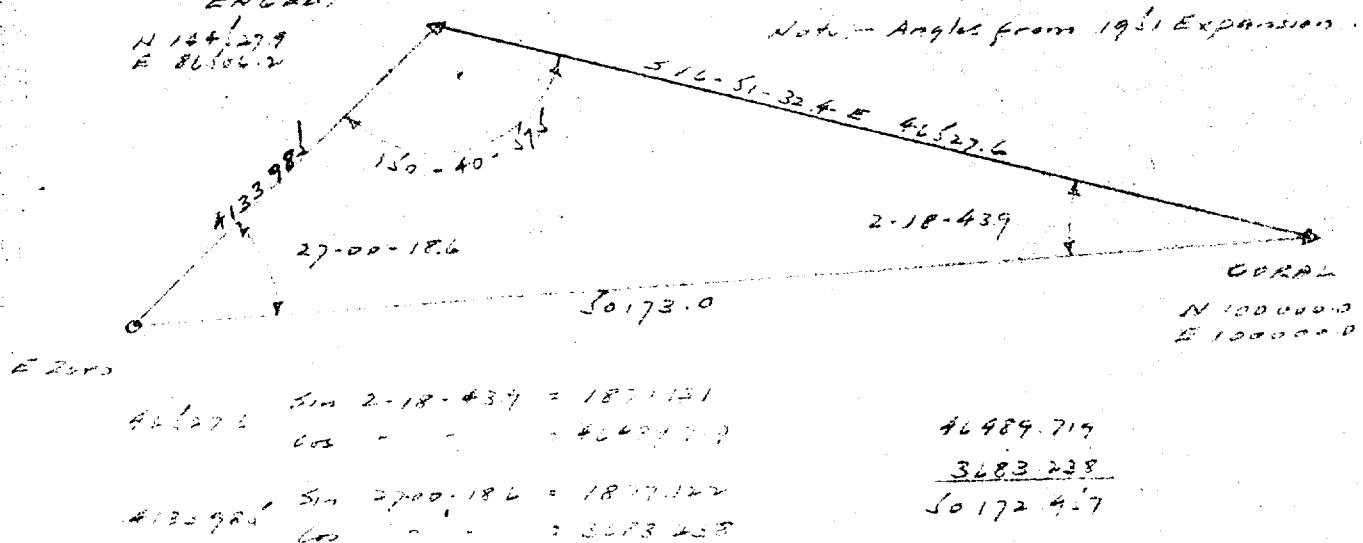
V 2000

Note - BASIC data from FG. 22, 84, 85'



ENGEBL
N 164.27.9
E 86106.2

Note - Angles from 1951 Expansion.



COMPUTATION OF TRIANGLES

COMPUTED BY	A.R.B.	CHECKED BY	L.S.H.	DATE	2-12-52	
STATION	OBSERVED ANGLE	CORR-N	SFERICAL ANGLE	SFERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3						4.1517267
1 E-Zero	27-00-	-	18.6	0.0	18.6	0.3428764
2 Engebi	150-40-	-	57.5	0.0	57.5	9.6898828
3 Coral	2-18-	-	43.9	0.0	43.9	8.6057839
I-3					15292.76	4.1844859
I-2					1260.05	3.1003870
2-3						3.9985000
1 V-Zero	73-35-	-	21.7	0.0	21.7	0.0180630
2 Aomon	99-25-	-	56.8	0.0	56.8	9.9940881
3 Coral	6-58-	-	41.5	0.0	41.5	9.0845462
I-3					10248.28	4.0106511
I-2					1262.14	3.1011092
2-3						3.8747531
1 C-Zero	31-35-	-	05.2	0.0	05.2	0.2808690
2 Coral	0-43-	-	17.8	0.0	17.8	8.1001684
3 N. Base #2	212-18-	-	23.0	0.0	23.0	9.7279043
I-3					180.21	2.2557895
I-2					7647.60	3.8835254
2-3						3.1011110
1 Lucy	6-10-	-	48.8	0.0	48.8	0.9679610
2 V-Zero	9-18-	-	23.2	0.0	23.2	9.2087498
3 Aomon	164-30-	-	48.0	0.0	48.0	9.4265342
I-3					1895.93	3.2778218
I-2					3130.44	3.4956062

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HOLMES & HARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMPUTED BY A.R.B. DATE Feb. 1952.

α	2 N. Base #2 to 3 Coral	75	02	07.9	α	3	10 2	
α'	8	+212	18	23.0	$3d\angle$		8	
$\Delta \alpha$							10 1	
α	2 N. Base #2 to 1 C-Zero	287	20	30.9	α	3		
$\Delta \alpha$		+ 1.1			$\Delta \alpha$			
α'							180	00 00.0
α	1 C-Zero to 2 N. Base #2	107	20	32.0	α'		10 3	
α'								

FIRST ANGLE OF TRIANGLE

Logarithms		Values in seconds		Logarithms		Values in seconds		Logarithms		Values in seconds	
ϕ	11 33 23.267 2	N. Base #2	λ	162	21	09.893	ϕ	3			
$\Delta \phi$	- 01.748		$\Delta \lambda$		+	05.677	$\Delta \phi$				
ϕ'	11 33 21.519 1	C-Zero	λ'	162	21	15.570	ϕ'				
$\frac{1}{2}(\phi + \phi')$								$\frac{1}{2}(\phi + \phi')$			
s	2.2558030		$\frac{1}{2}(\phi + \phi')$	11 33 22.893	s			$\frac{1}{2}(\phi + \phi')$			
$\cos \alpha$	9.4743230				$\log \alpha$	9.9797965a					
B	8.5124992	1st term +1.7483			A'	8.5096676					
n	0.2426252				$\sec \phi'$	0.0088939					
j^2	4.612				$\Delta \lambda$	0.7541600	-6.6775	C			
$\sin^2 \alpha$	9.960										
c	.717	2 d term + .0000			$\sin \frac{1}{2}(\phi + \phi')$	9.3017446					
n^2	6.189				$-\Delta \alpha$	0.0559046	-1.14	n^2			
b	.49							D			
b	1.98										
2.47		3 d term + .0000									
b	- $\Delta \phi$	+ 1.7483									

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HOLMES & MARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMPUTED BY A.R.B. DATE Feb. 1952

α	2-Engebi	to 3	Coral	343	08	-00.2	α	3	to 2
$\angle d$		8		+150	40	57.5	$3d\angle$	8	
α	2 Engebi	to 1	E-Zero	133	48	57.7	α	3	to 1
$\Delta \alpha$				-	6.1	$\Delta \alpha$			
α'	E-Zero	to 2	Engebi	313	48	51.7	α'	1	to 3
α'				180	00	00.0			
α'								180	00 00.0

FIRST ANGLE OF TRIANGLE

$\frac{1}{2}(\phi + \phi')$		Logarithms		Values in seconds		$\frac{1}{2}(\phi + \phi')$		Logarithms		Values in seconds	
ϕ	11 39 41.964	2	Engebi	λ	162 14	56.161	ϕ	λ	-	$\Delta \lambda$	$\Delta \lambda$
$\Delta \phi$		+	28.392		-	30.019	$\Delta \phi$				
ϕ'	11 40 10.356	1	E-Zero	λ'	162 14	25.132	ϕ'	λ'	1		
Logarithms	Values in seconds			Logarithms			Logarithms			Values in seconds	
3.1003843	$\frac{1}{2}(\phi + \phi')$		11 39 56.160	S			$\frac{1}{2}(\phi + \phi')$			S	
Logarithms	Values in seconds			Cos α			Logarithms			Sin α	
9.8403228	B		00	B			Cos α			A'	
8.5124960	C		00	B.1003843			B			Sec ϕ'	
1.4532031	H		1st term -28.3925	Sin α		9.8582762	C			$\Delta \lambda$	
6.201	J			A		8.5096665	C			Sin α	
3.2	K			Sec ϕ'		0.0090708	D			A'	
5in ² α	L			Sin ² α			D			Sec ϕ'	
9.717	M			C			D			$\Delta \alpha$	
0.721	N			$\Delta \lambda$		1.4773978	C			Sin $\frac{1}{2}(\phi + \phi')$	
6.639	O		2 d term + .0004	Sin ² $\frac{1}{2}(\phi + \phi')$		9.3057797	D			- $\Delta \alpha$	
2.91	P			- $\Delta \alpha$		0.7831775	D			3 d term +	
1.99	Q			4.90		.0000	D			- $\Delta \phi$	
				- $\Delta \phi$		-28.3921					

HOLMES & HARVER, INC.
ENGINEERS-CONSTRUCTORS

SECOND ORDER TRIANGULATION COMPUTATION POSITION

FIRST ANGLE OF TRIANGLE

HOLMES & TAYLOR
ENGINEERS - CONTRACTORS
PLANS COORDINATES - IYY GRID
1952 ADJUSTED HORIZONTAL CONTROL

TRAVERSE COMPUTATIONS.

CALC. BY A.R.B.
CHECKED BY L.S.H.
DATE 07.1.1952

JOB NO. 831 LOCATION Riegel #1

STATION	COURSE	DISTANCE	LATITUDE		DEPARTURE		COORDINATES SOUTH	COORDINATES EAST	COORDINATES WEST
			NORTH	SOUTH	EAST	WEST			
1. Dreibl	S 44-17-47 deg. 21' 52" E	7157.270	5617.210	57247.20	144527.9	86506.2			
2. N. Base #2	S 63-21-37 deg. 47' 47" E	3524.9052	91569.26	106384.8	123753.4				
3. Riegel #1	N 26-42-13 deg. 57' 21" E	5093.924	72664.21	2449.09	71863.7	32164.1			
4. Dreibl			5937.557	54522.34	144527.9	86506.2			
5.									
6.									
7.									
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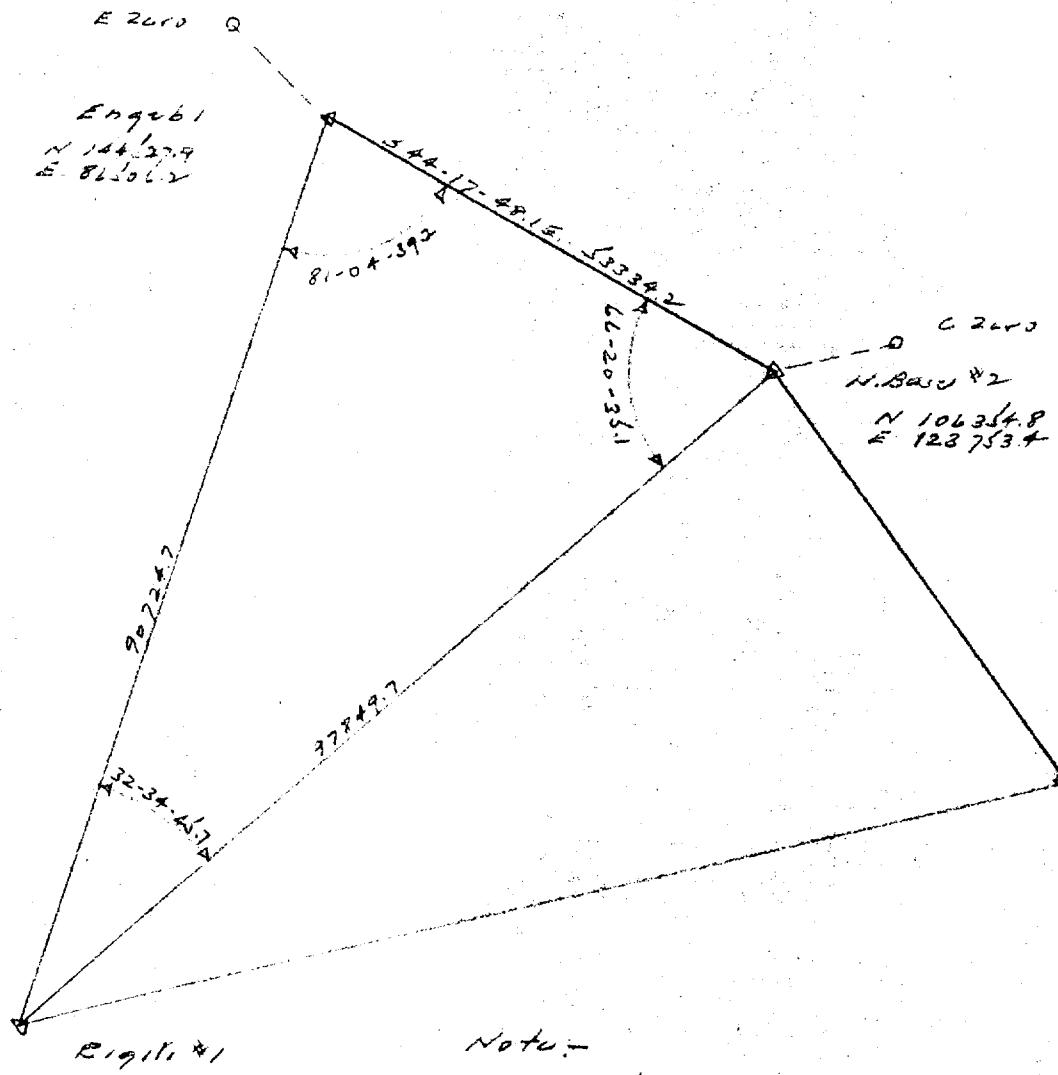
BY A.R.B. DATE May 1957
CHKD. BY L.S.H. DATE Nov 1957

SUBJECT TERRAIN SURVEY ADJ.
1952 ADJUSTMENT

SHEET NO. 1 OF 1

JOB NO. 831

Ed 61.61 #1



Notes

The data available from FS #52 is insufficient for a complete adjustment. As the survey satisfied the accuracy requirements for this station the adjusted positions of stations Engub 1 and N. Basu #2 were used and the angles per FS #52.

COMPUTATION OF TRIANGLES

COMPUTED BY L.S.H.

CHECKED BY L.S.H.

DATE Nov. 1952

STATION	OBSERVED ANGLE	CORR-N	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3					16256.33	4.2110225
1 Rigili #1	32-34--	-	46.0	0.3	45.7 *	0.2688407
2 Engebi	81-04--	-	39.6	0.4	39.2 *	9.9947127
3 N. Base #2	66-20--	-	36.5	0.4	35.1 *	9.9618787
I-3					29824.65	4.4745759
I-2					27652.94	4.4417419
*	* = Data from Field Sketch #92					RIGILI #1
2-3						
1						
2						
3						
I-3						
I-2						
2-3						
1						
2						
3						
I-3						
I-2						
2-3						
1						
2						
3						
I-3						
I-2						

HOLMES & NARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMPUTED BY A.R.B. DATE Feb. 1952.

α'	2 Engebi	to 3 N. Base #2	315	41	44.4	α	3 N. Base #2	to 2 Engebi	135	42	59.8
$\Delta \alpha$	A		+ 81	04	39.6 *	$3d\angle$	8		- 66	20	35.5 *
α'	Engebi	to 1 Rigilli #1	36	46	24.0	α	3 N. Base #2	to 1 Rigilli #1	69	22	24.3
$\Delta \alpha$			- 01	49.4	$\Delta \alpha$			-	03	03.07	

α'	Rigilli #1 to 2 Engebi	216	44	34.6	α	Rigilli #1 to 3 N. Base #2	249	19	20.6
$\Delta \alpha$	C	00	00.0				180	00	00.0

FIRST ANGLE OF TRIANGLE 32-34-46.0 *

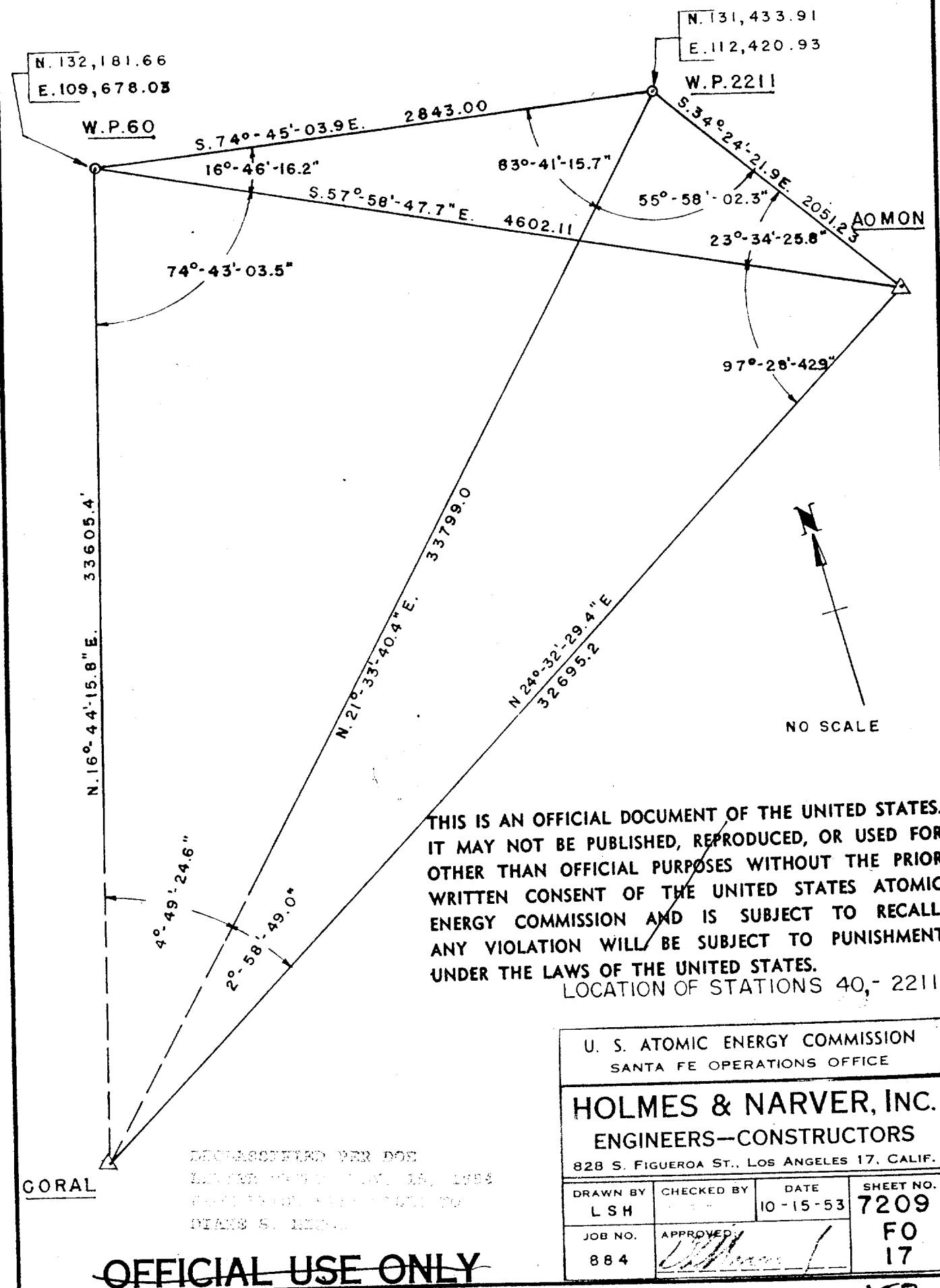
ϕ	11 39 41.964 2 Engebi	λ	162	14	55.151	ϕ	11	33	23.267	3 N. Base #2	λ	162	21	09.893
$\Delta \phi$	- 12 01.050	$\Delta \lambda$	-	09	06.174	$\Delta \phi$	-	05	42.353		$\Delta \lambda$	-	15	20.915
ϕ'	11 27 40.914 1 Rigilli #1	λ'	162	05	48.977	ϕ'	11	27	40.914	1 Rigilli #1	λ'	162	05	48.976

Logarithms Values in seconds Logarithms Values in seconds

$\frac{1}{2}(\phi + \phi')$	11 33 41.439	s	4.4745764 *	$\frac{1}{2}(\phi + \phi')$	11 30 32.091	s	4.4745754
Cos α	9.90365380	Values in seconds	Cos α	9.5468830	Values in seconds	Sin α	9.9712277
B	8.5124960		B	8.5124992		A'	8.5096685
h	2.8573755	1st term + 720.9008	h	2.5339576	1st term + 341.9461	$\sin \alpha$	9.9712277
g^2	8.633		s^2	8.949		A'	8.5096685
$\sin^2 \alpha$	9.564		$\sin^2 \alpha$	9.942		Sec ϕ'	0.0087478
C	.721		C	.717			
9.158	2d term + .1439 Sin $\frac{1}{2}(\phi + \phi')$	9.3019407	9.608	2d term + .4056 Sin $\frac{1}{2}(\phi + \phi')$	9.2999873	$-\Delta \lambda$	2.9642194 + 920.9147
H	5.72		$\Delta \alpha$	2.0392721	+109.46	$\Delta \alpha$	2.2642067 + 183.74
D	1.99		$\Delta \phi$	7.71	3d term + .0051	$-\Delta \phi$	342.3528
					+ 721.0498		

* = Data from Field Sketch #92

OFFICIAL USE ONLY



RECORDED IN THE PLAT BOOK
OF THE COUNTY OF LOS ANGELES, CALIF.
ON THE 15TH DAY OF NOVEMBER, 1953
BY THE ENGINEERS-CONSTRUCTORS
HOLMES & NARVER, INC.

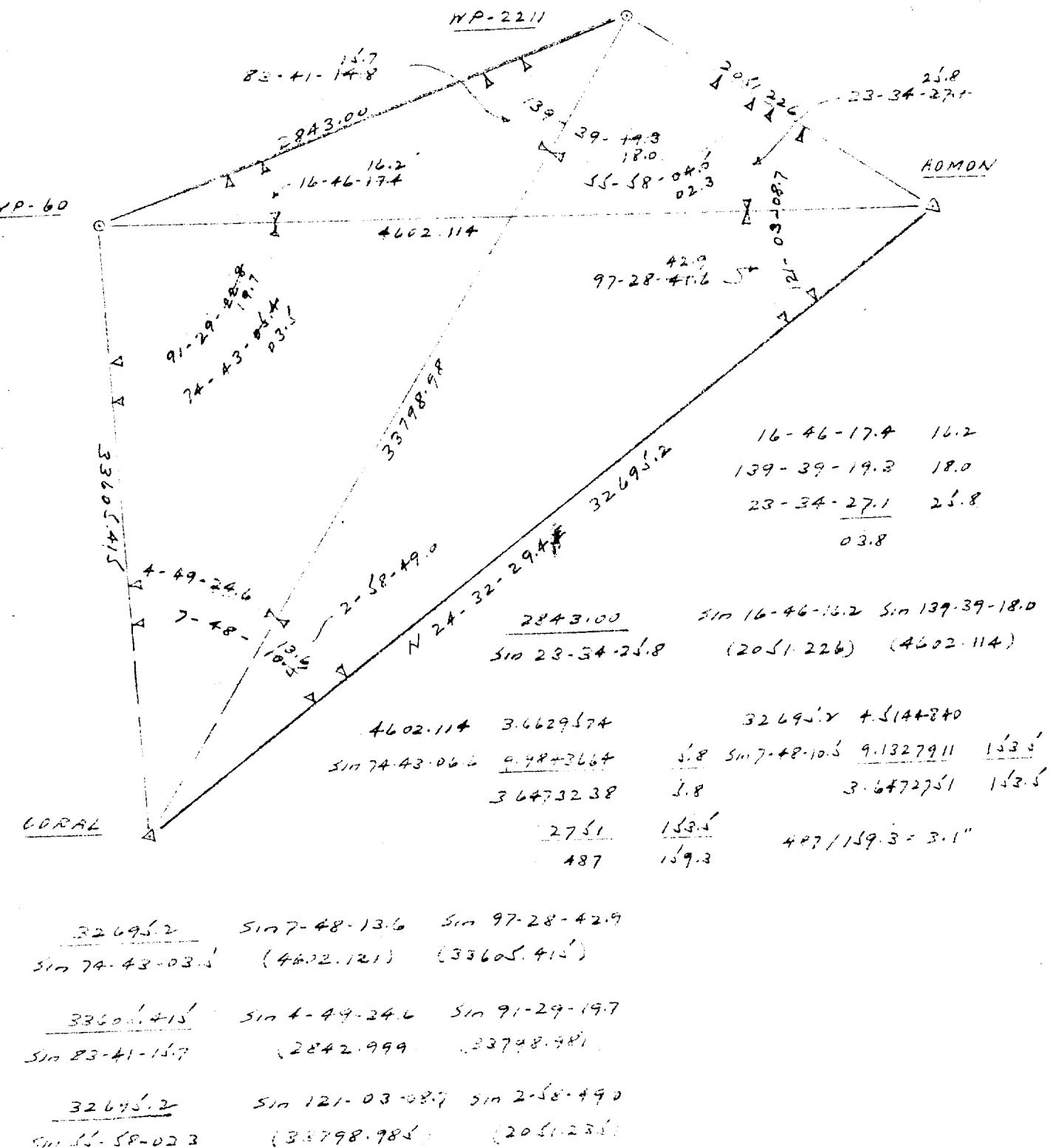
HOLMES & NARVER, INC.
ENGINEERS - CONTRACTORS
LOS ANGELES, CALIFORNIA

JOB No. 5441

SHEET 1 OF 4

BY J. S. H. DATE 12-13

TITLE SITE RUBY-SALLY LOCATION OF SIG. UD AND 2211



FORM T

HOLMES & NARVER INC. - ENGINEERS - CONTRACTORS

~~OFFICIAL USE ONLY~~

TRAVERSE SITE RUBY-SALLY

CALC. BY LSH

DATE 10-12

LOCATION OF STA 60.2211

JOB NO. 884

CHKD. BY

DATE

SHEET NO. 2 OF 4

STATION	BEARING	DISTANCE	COSINE	SINE	CO-ORDINATES		
					NORTH	EAST	
1							1
2 C 0 R H L							2
3 W P - 60	121° 44' 11.8E	322.05' A	957.633.10	2879.7016	1172.181.612	E 916.720.029	3
4 W P - 22.11	524.46.03.95'	2843.00	26201.387	9647.922.9	5742.748	E 2742.904	4
5 A O M O N	524.24.21.98'	205.1.23	23101.312	161672.371	61169.051	E 112.420.92	5
6							6
7							7
8 L P S - 6	121° 33' 40.4E	3229.8.94	93022.542	367.69519	11314.33.922	E 12420.916	8
9							9
10							10
11							11
12 W P - 60							12
13 A O M O N	517.18.42.7E	4602.11	52022.649	867.826.230	5244.2.111'	E 390.019.16	13
14							14
15							15
16							16
17							17
18							18
19							19
20							20
21							21
22							22
23							23
24							24
25							25
26							26
27							27
28							28

RECLASSIFIED GEN DATE
JULY, 1954
BY J. S. HULL TO
DIRIGE S. HULL

155

HOLMES & NARVER INC - ENGINEERS CONSTRUCTORS

COMPUTATION OF SITE SUB-SALAR BASE LINE

CALC. BY: H.B. CHKD BY: J.H. DATE: 7-13

~~OFFICIAL USE ONLY~~

JOB NO. 2224 LOCATION ENNISVILLE, GA.

DIR. TAPE SUP-
OF PORT
MEAS NO

UNCORR. LENGTH
NO METERS

TEMP "C"
METERS

TEMP SET-UP
SET-BACK

INCLINATION
METERS

SEA LEVEL
METERS

REDUCED
LENGTH
METERS

ADOPTED
LENGTH
METERS-FEET

0+000.70 2-1-53 E 3172 10 49.99213 +.0025 -.0300 -.0189 49.99244 49.99244

SITE #10 8-1 E 8187 10 49.99224 +.0032 -.0229 -.0189 49.99234

SITE #10 8-1 E 8187 9 49.99234 +.0025 +.0311 -.0262 49.99239 49.99239

SITE #10 8-1 E 8193 9 49.99233 +.0032 +.0263 -.0262 49.99236 49.99236

TO TOTAL 49.99236 49.99236

ADJUSTED 49.99236 49.99236

W.P. 60 2843.003 2843.003

W.P. 211

RECORDED FOR DOB
HOLMES & NARVER, CITY, 15. 1994
BY SITES SUB-SALAR TO
ENNISVILLE, GA.

~~OFFICIAL USE ONLY~~

COMPUTATION OF TRIANGLES

DECLASSIFIED PER DOE
LETTER DATED JULY, 15, 1994
FROM ANTON SINGGALLI TO
DIANE S. NIXON

DATE 10-13

COMPUTED BY LSH CHECKED BY

STATION	OBSERVED ANGLE	CORR-N	SPHERICAL ANGLE	SPHERICAL EXCESS	PLANE ANGLE AND DISTANCE	LOGARITHM
2-3						3.9985000
1 WP-60	74-43-03.5	-	03.5	0.0	03.5	0.0156353
2 AOMON	97-28-42.9	-	42.9	0.0	42.9	9.9962899
3 CORAL	7-48-13.6	-	13.6	0.0	13.6	9.1328387
I-3					102 42.95	4.0104252
I-2					1402.73	3.1469740
2-3						
1 WP-60			4602.1 = 1402.724		AOMON	
2						
3						
I-3						
I-2						
2-3						
1						
2						
3						
I-3						
I-2						
2-3						
1						
2						
3						
I-3						
I-2						
2-3						
1						
2						
3						
I-3						
I-2						

HOLMES & NARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMPUTED BY C.S.C. DATE 10/13/34

α	2 AOMON	103.00242	24	32	31.8	α	3 CORAL	102.40000	202	32	29.4
2d \angle		8.				3d \angle	8		-7	48	13.3
α	2 AOMON	101.400-60	122	01	39.7	α	3 CORAL	101.400-60	196	42	15.0
$\Delta \alpha$						$\Delta \alpha$			+7	0	19.3
α'	1 AOMON	10.2 ADON	302	01	21.8	α'	1 AOMON	10.3 CORAL	12	44	21.4

FIRST ANGLE OF TRIANGLE 74-43-03.5

Logarithms Values in seconds		Logarithms Values in seconds		Logarithms Values in seconds		Logarithms Values in seconds		Logarithms Values in seconds		Logarithms Values in seconds			
S	3.1469210	$\ell(\phi + \theta')$	11-32-29 38.8	S	4.0004211	$\ell(\phi + \theta)$	11-34-59.872	S	4.0002111	$\ell(\phi + \theta)$	11-34-59.872		
Cos α	9.7224141	Logarithms	Values in seconds	Cos α	9.98119.92	Logarithms	Values in seconds	Cos α	9.98119.92	Logarithms	Values in seconds		
B	8.6124972	Values in seconds		B	8.6124997	Values in seconds		B	8.6124997	Values in seconds			
H	1.384013.7	1st term	-24.21.1	H	2.60422.0	1st term	-31.924.9	H	2.60422.0	1st term	-31.924.9		
g^2	6.29334	Sim α	9.928289.2	s^2	9.020.8	Sim α	9.928289.2	s^2	9.020.8	Sim α	9.928289.2		
Sim α	9.816.18	A	2.609666.9	Sec ϕ'	0.009000.1	Sec ϕ'	0.009000.1	Sec ϕ'	0.009000.1	Sec ϕ'	0.009000.1		
C	0.719.24	$\Delta \alpha$	1.593922.3	-39.24.4	C	0.711.6.9	2d term	+.0045	C	0.711.6.9	2d term	+.0045	
H ²	6.870.34	2d term	+.0009	Sim $\frac{1}{2}(\phi + \theta')$	9.30922.59.8	H ²	6.00802	Sim $\frac{1}{2}(\phi + \theta')$	9.30922.59.8	H ²	6.00802	Sim $\frac{1}{2}(\phi + \theta')$	9.30922.59.8
D	1.987.1	$\Delta \alpha$	0.89819.21.4	2.910	D	1.987.1	3d term	+.0000	D	1.987.1	3d term	+.0000	
	4.751.1	3d term	+.0000			6.9927				-31.92394			
		- $\Delta \phi$	-24.21.02										

158

GENERAL CONTROL LOCATION
SITE BELLE

10-19-53
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P21 "E" - 200 - E1 9.16
P22 "C" - 486 - 48-DC-76.51

PIA N 140329 59
E 55,256 51

P.I.'E' N14°45'.50
E55,502.66

DECLASSIFIED BY: DOB
NUMBER DATED JULY, 16, 1994
FILE NUMBER 10-15841 TO
BLANK 2, K200

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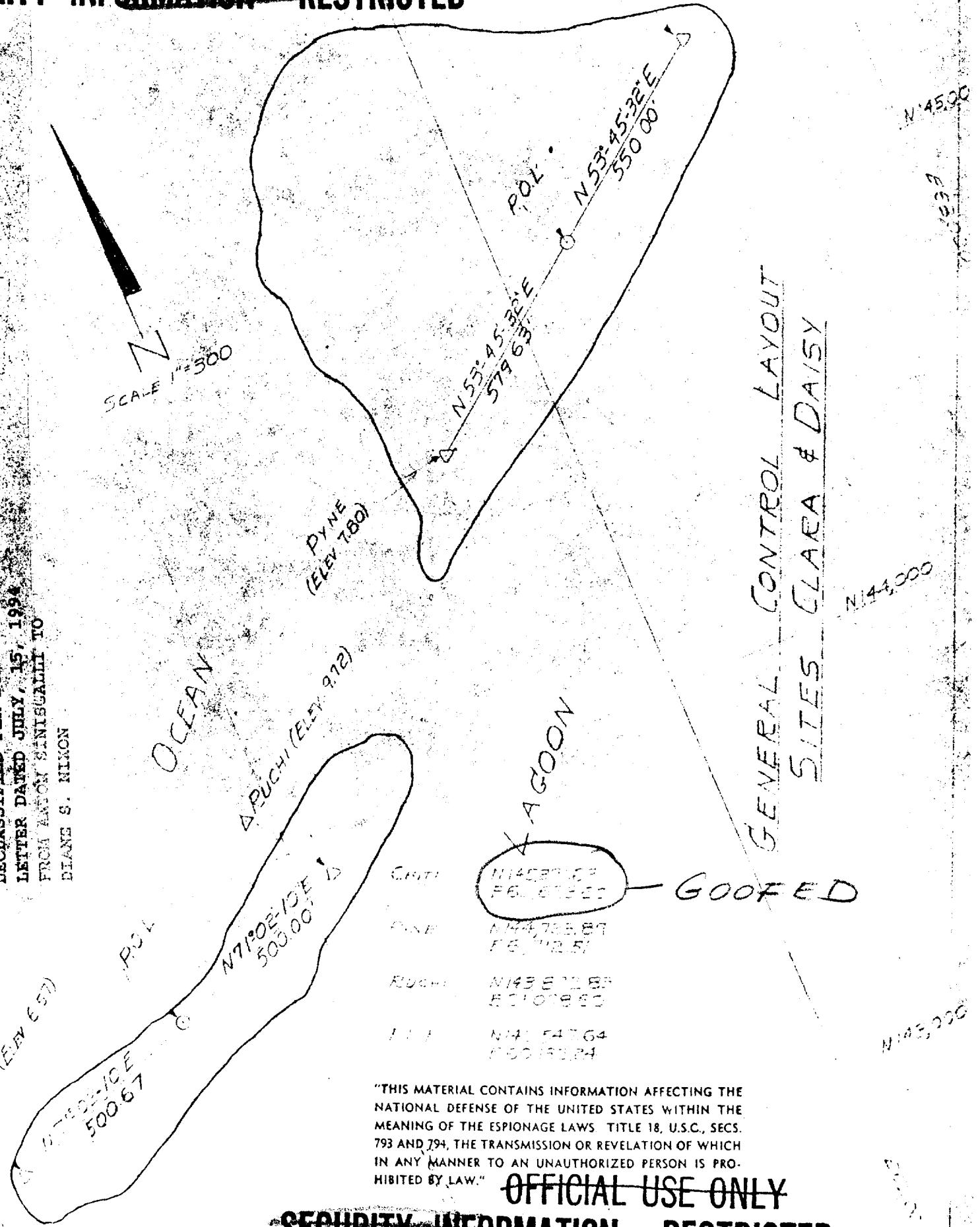
161

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FROM AGENT SINGULARITY TO
MURKIN S. NIXON



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LETTER DATED JULY, 15, 1994
FROM DEFENDANT'S ATTORNEY TO

БИБЛІОГРАФІЯ

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NOTES:

BASE LINE OFFSETS
ARE ONE MON

REFERENCE

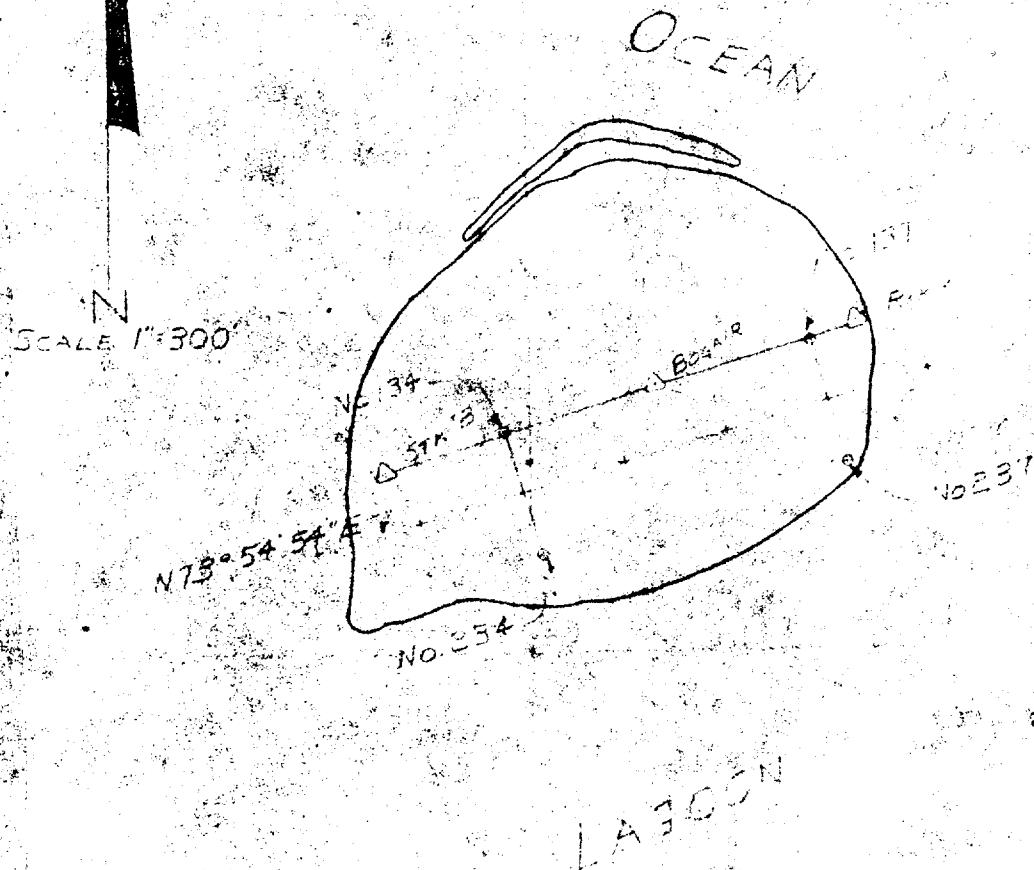
For COORDINATES SEE
Dwg FS 567, Sht 2

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MEANING OF THE ESPIONAGE LAWS. TITLE 18, U.S.C., SECS.
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WEDNESDAY, JULY 15, 1994

THIS FORM IS APPROPRIATE TO

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NOTES:

HORN POINT OFFSET'S
AND LONG Mtn.

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E 86 506.40
JULY DATED JULY, 15, 1994
FROM ANTHONY SANCHEZ TO
RICHARD M. NIXON

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LATER DATED JULY, 15, 1994

FROM ANTHONY SANCHEZ TO

RICHARD M. NIXON

GENERAL ELECTRIC LABORATORY
SACRAMENTO, CALIFORNIA

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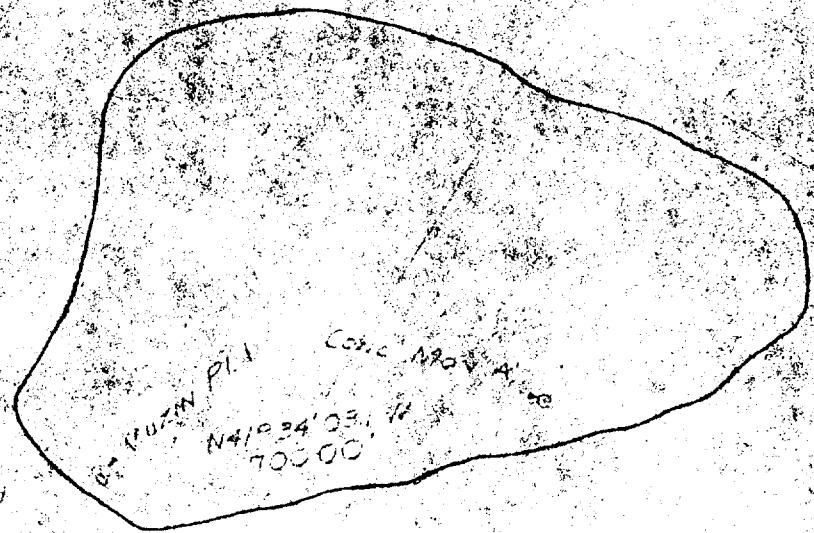
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LAGOON

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FROM ANTON SIMISGALLI TO
DIANE S. NIXON

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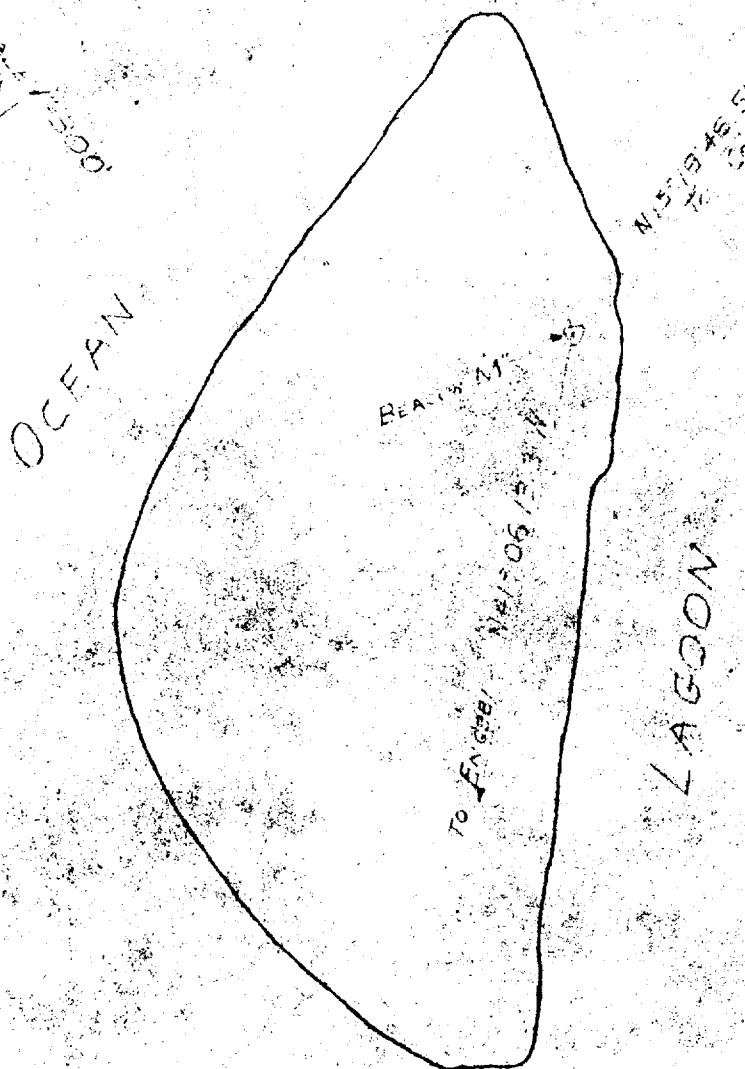
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GENERAL CONTROL LAYOUT
SITE 1608

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169

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ON THE SUBJECT OF THE
OLD TESTAMENT AND NEW
TESTAMENT, & THE
WISDOM OF GOD.

BENTON CENTER STATE
SITE MAP

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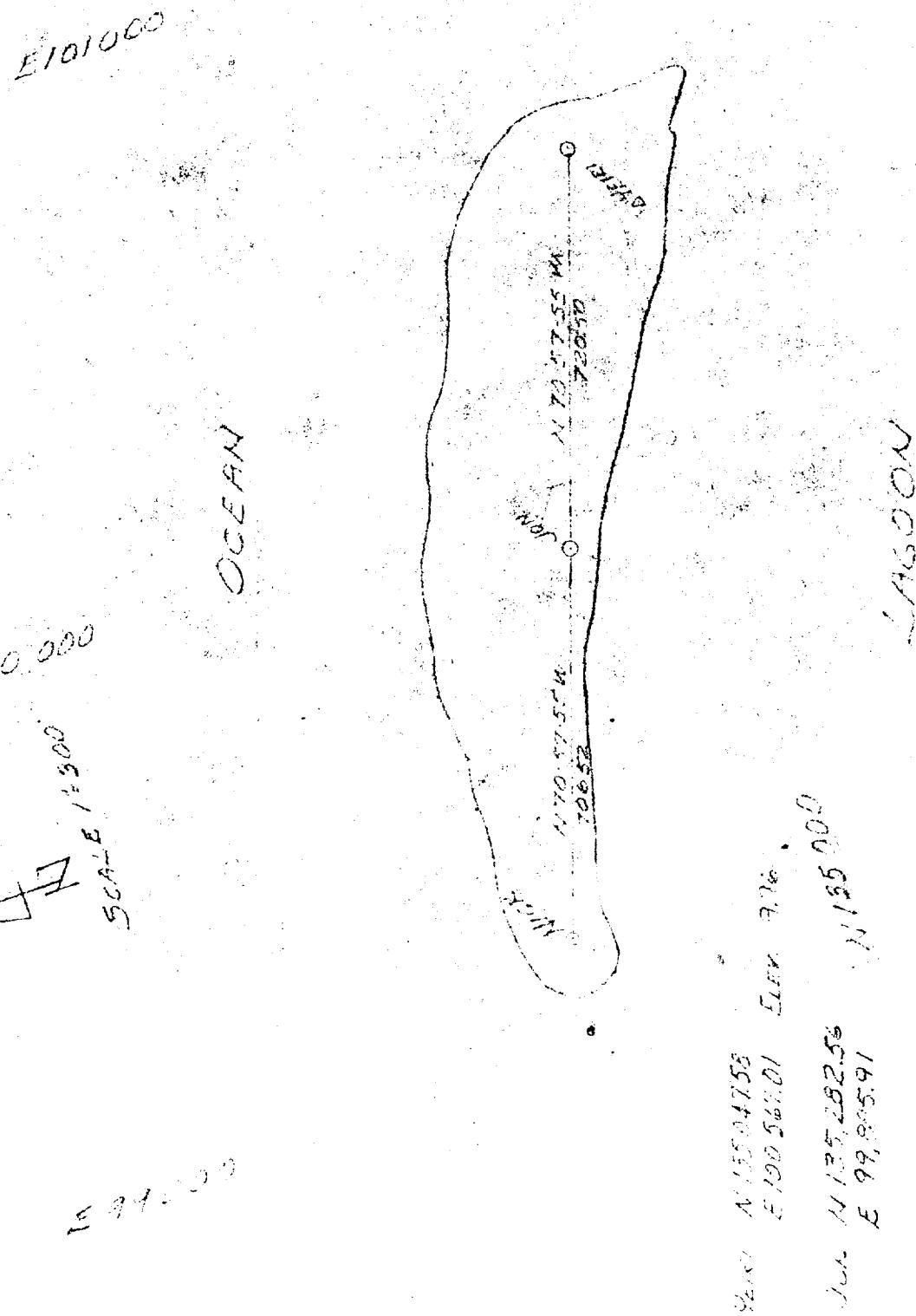
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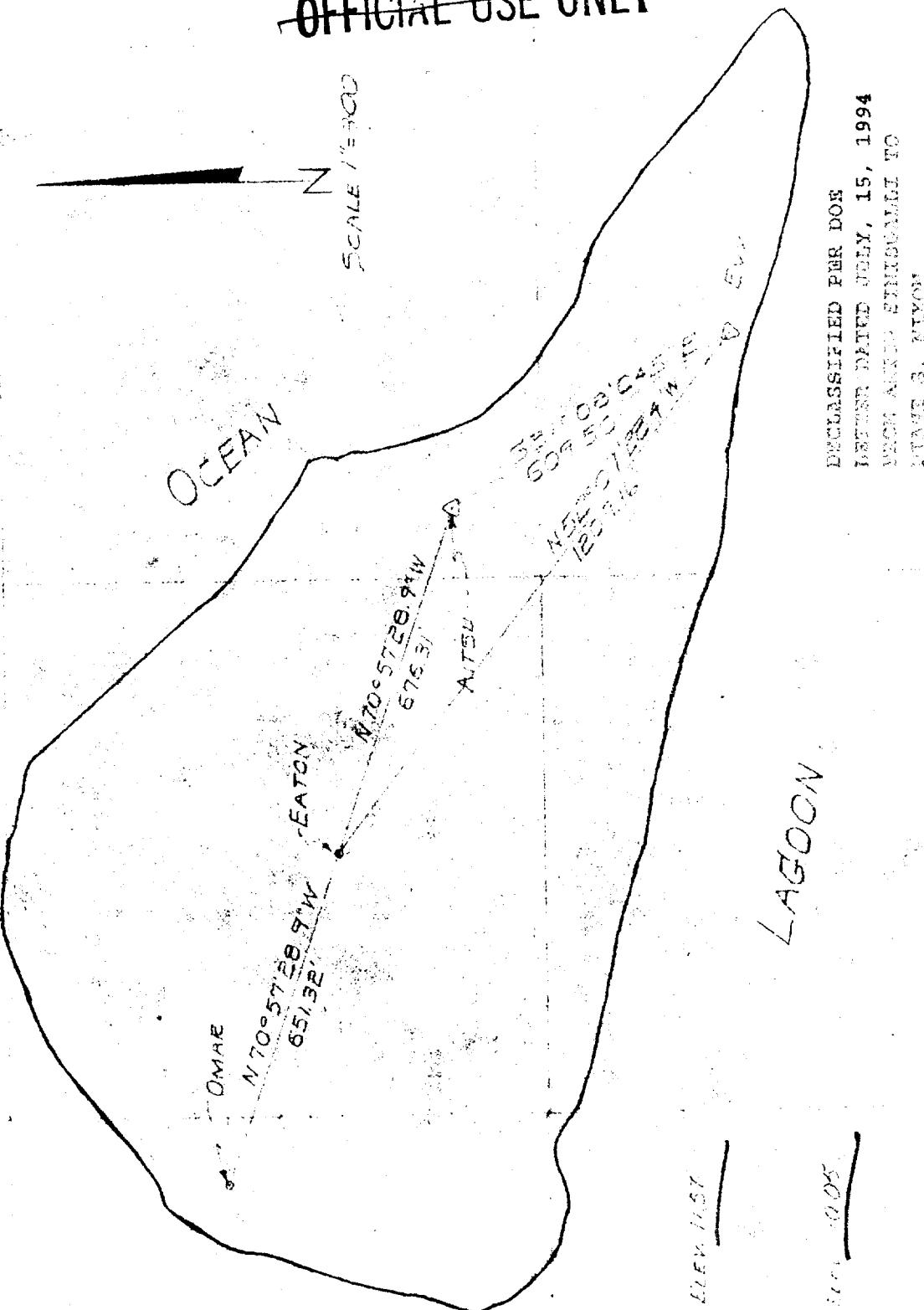
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FROM MR. JAY SUNDSTROM TO
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HIBITED BY LAW."

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N104,283.57
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DATE OF RELEASE: 10/10/2001

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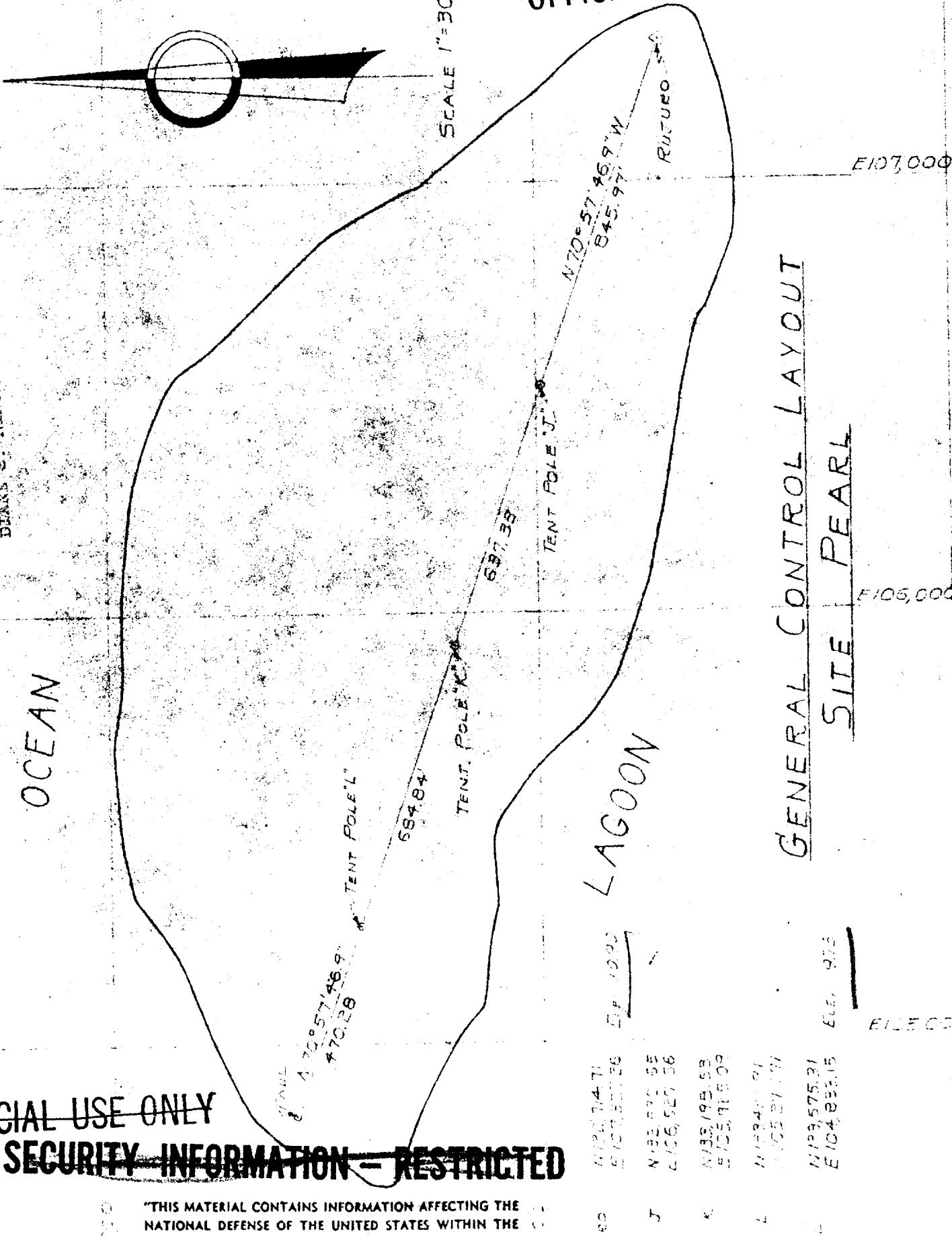
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SCALE 1"=300'

55° 06' 18" W
12° 17' 40" N

100° 50' 7" E
32° 49' N

R.P. KATE

S 160° 07' 16" E
N 25° 58' 16" S

LAGOON

R.P. KATE N 127° 06' 59" S
E 115° 34' 7.23" E ELEV. 833

JACK N 127° 19' 01" S
E 117° 36' 53" E

LORD N 128° 50' 16" S
E 117° 39' 2.23" E

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15 MAY 1986 JULY 15, 1986
BY THE DIRECTOR OF DEFENSE
INTELLIGENCE COMMUNICATED TO
DR. RICHARD M. NIXON

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N BASE #3

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W 6,000

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N 106,554.2
E 123,753.9

N 103,059.65
E 126,749.58

N 101,904.67
E 127,717.43

N 101,120.14
E 127,769.99

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E 128,877.5

OPEN

SCALE 1:1000'

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FROM ANTON SINISCALLI TO
DIANE S. NIXON

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FROM ANTHON SINISGALLI TO
DINNE S. NIXON

R.P.A.
N 119 5010
M 119 5025

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GEOGRAPHIC POSITIONS

LOCATION Eniwetok Atoll M.I.

DATUM USN 1944

Second

JOB NO. 942

ORDER TRIANGULATION
SHEET 1 OF 1

STATION	LATITUDE	LONGITUDE	AZIMUTH	BACK AZIMUTH	TO STATION	LOG. METERS	METERS	DISTANCE	FEET
Alice	11-38-46.347N	242-21-56.7	62-22-33.6	Gene	3.7959010	6250.302	20,506.2		
	162-09-16.507E	260-31-54.4	80-33-02.8	Engebi	3.0169753	1039.861	34,116.1		
	309-31-15.8	129-32-51.1	Coral	4.2703683	18636.668	61,143.8			
Gene	11-40-20.683N	284-08-38.9	104-09-10.4	Engebi	3.6872608	4866.995	15,967.8		
	162-12-19.333E	329-05-35.4	149-06-34.1	Coral	4.2356051	17203.037	56,440.3		
			Alice	3.7959010	6250.302	20,506.2			
Mack	11-32-57.854N	243-05-38.3	63-06-41.2	Piiraa1	4.0274096	10651.471	34,945.7		
	162-14-54.033E	285-33-27.5	105-33-54.9	Coral	3.6341150	4206.406	14,128.6		
Yvonne	11-33-23.264N	75-02-10.5	255-01-22.7	Coral	3.8747550	7494.712	24,588.9		
	162-21-09.895E	154-56-03.3	334-55-50.8	Piiraa1	3.6491177	4457.770	14,625.2		
		322-47-25.7	142-47-36.1	Runit	3.4136135	2591.872	8,503.5		

PLANE CO-ORDINATES

LOCATION Eniwetok Atoll MI
PROJECTION Plane Grid1955 Expansion
JOB NO. 942 SHEET 1 OF 1

STATIONS	BEARING	DISTANCE	LATITUDE	DEPARTURE	COORDINATES	
					NORTH	EAST
1					-	-
2 Alice to	N62-23-32.4E	20.506.15	9.502.85+18.171.35	138.931.4	52.852.2	2
3 Gene	N80-33-30.1E	34.116.13	5.596.51+33.653.96	148.434.2	71.023.6	3
4 Engebi	S50-27-08.8E	61.143.82	-38.931.40+47.147.78	144.527.9	86.506.2	4
5 Coral				100.000.0	100.000.0	5
6					6	
7 Gene to	S75-50-22.4E	15.967.80	-3.906.34+15.482.61	148.434.2	71.023.6	7
8 Engebi	S30-53-25.9E	56.440.3	144.527.9 +13.493.8	144.527.9	86.506.2	8
9 Coral				100.000.0	100.000.0	9
10					10	
11 Mack to	N63-06-05.8E	34.945.67	+15.809.76+31.164.91	103.791.2	86.389.6	11
12 Piraai	S74-26-05.0E	14.128.57	-3.791.20+13.610.40	119.601.0	117.554.5	12
13 Coral				100.000.0	100.000.0	13
14					14	
15 Yvonne to	S75-01-22.7W	24.588.92	-6.354.56+23.753.63	106.354.5	123.753.6	15
16 Coral	N25-04-44.5W	14.625.21	+13.246.40-6.199.16	100.000.0	100.000.0	16
17 Piraai	S37-13-22.1E	8.503.49	-6.771.24+5.143.90	149.601.0	117.554.5	17
18 Runit				99.583.3	128.897.5	18
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TITLE

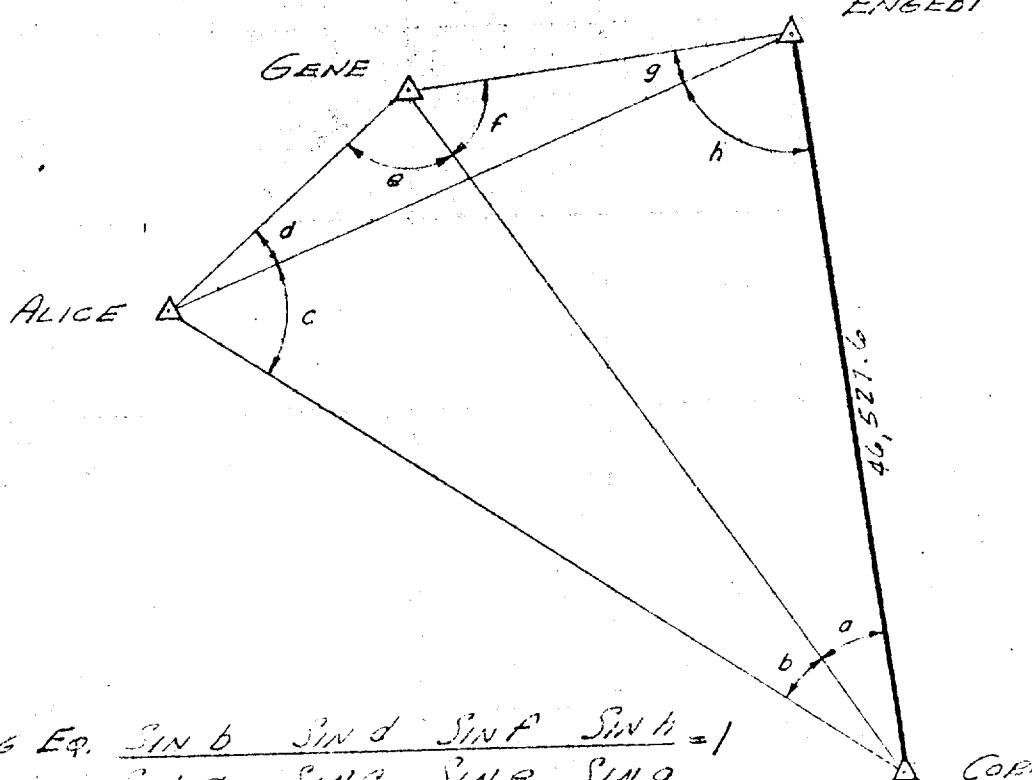
HOLMES & NARVER, INC.
 ENGINEERS - CONSTRUCTORS
 LOS ANGELES, CALIFORNIA

JOB NO. 115

SHEET 1 OF 2

BY M.R. DATE 7/11/55

QUADRANGLE ADJUSTMENT (GENE)



$$\text{TRIG EQ. } \frac{\sin b}{\sin d} \frac{\sin d}{\sin f} \frac{\sin f}{\sin h} = 1$$

$$\frac{\sin c}{\sin e} \frac{\sin e}{\sin g} \frac{\sin g}{\sin a} = 1$$

MEAS. #	GEO. COND.	TRIG COND.	
a	4-01-53.9	53.1	53.5
b	19-33-44.6	43.7	42.9
c	48-59-21.0	20.1	21.1
d	18-07-59.0	58.1	57.7
e	13-16-57.8	56.9	58.3
f	44-36-58.3	57.4	56.4
g	23-33-07.7	66.8	67.6
h	17-25-04.8	63.7	62.5

$$\text{LSS. IN } a = 9.5248236 \quad 59.27 \quad \text{LSS. IN } d = 9.3944250 \quad 84.27$$

$$d = 9.4735424 \quad 64.20 \quad e = 9.8717873 \quad 18.21$$

$$f = 1.8491000 \quad 21.10 \quad g = 1.9792869 \quad 1.235$$

$$h = 9.9963593 \quad 2.744 \quad h = 1.6014711 \quad 49.17$$

$$\underline{8.8041163} \quad \underline{147.314}$$

$$\underline{09.03} \quad \underline{260}$$

$$\underline{8.8040753} \quad \underline{151.915}$$

$$147.314$$

$$249.287$$

$$250/398.287 = .87"$$

183

HOLMES & NARVER, INC.
ENGINEERS - CONSTRUCTORS
LOS ANGELES, CALIFORNIA

JOB NO. 746
SHEET 2 OF 2
BY M.P. DATE 7/11/55

TITLE GENEKANGE Investments (Gene)

LOG SIN 0 = 9.5249183	59.27	LOG SIN 0 = 9.3346325	84.29
$d = 9.4438366$	64.20	$c = 7.8177087$	18.31
$f = 9.8490980$	21.10	$e = 9.9992968$	1.205
$h = \frac{9.7963506}{8.8641035}$	<u>2.744</u>	$g = \frac{9.6024154}{8.8641034}$	<u>49.17</u>
	<u>147.314</u>		<u>151.715</u>
	<u>1024</u>		<u>147.314</u>
	<u>1</u>		<u>299.289</u>

$$1/299.289 = .003''$$

46,521.6
SIN 44-56-564
(75447709)

15,967.801
SIN 14-01-53.5
(34245578)

56,440.317
SIN 161-01-10.1
(65677231)

56,440.317
SIN 67-07-18.3
(92156302)

61,143.513
SIN 93-16-58.3
(99835899)

20,536.143
SIN 19-33-42.9
(33452532)

46,521.6
SIN 45-59-21.1
(75458254)

61,143.520
SIN 77-25-02.5
(99163208)

34,116.127
SIN 35-25-36.4
(55327624)

34,116.127
SIN 128-13-54.7
(66611752)

15,967.805
SIN 16-09-37.7
(34177157)

20,536.143
SIN 23-36-01.6
(40038279)

HOLMES & NARVER, INC.
ENGINEERS . CONSTRUCTORS
LOS ANGELES, CALIFORNIA

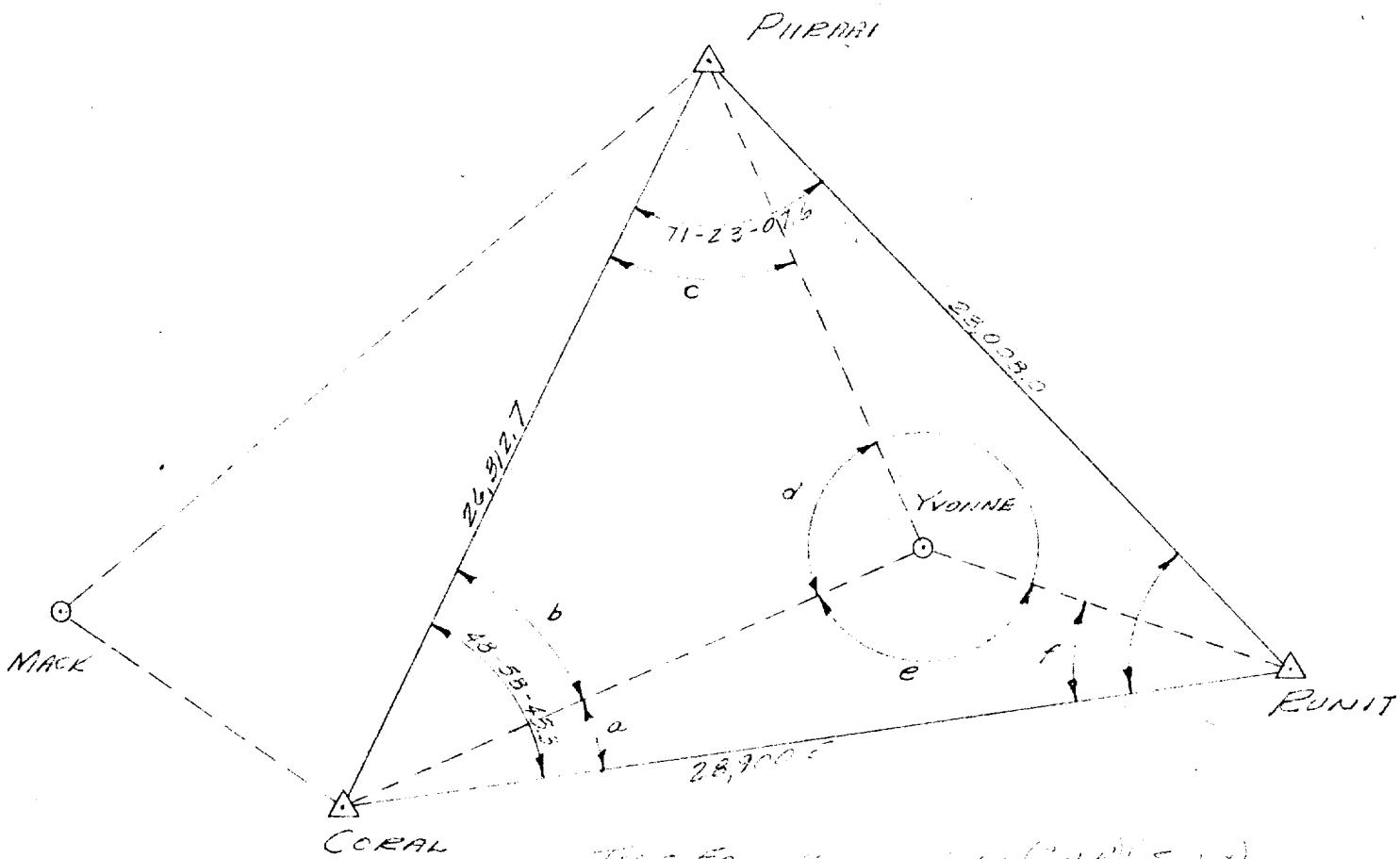
JOB NO. 742

SHEET 1 OF 2

BY M.R. DATE

TITLE

ANGLE ADJUSTMENT - YVONNE



TRIG. Eqs. = Coral - MACK (W.A) / Sides = 1
Coral - PHIRAH (Sides)

	MEAS. A	GEO.	COND.	TRIG. COND. (a)	COND. (b)
a	15-48-12.1	11.3	{ 43.5	13.3	43.3
b	33-10-38.6	32.0		35.4	35.3
c	66-55-35.8	37.3		52.1	52.3
d	79-53-52.2	50.7		45.5	45.3
e	112-14-48.7	46.9		63.2	63.1
f	51-57-02.5	01.8			

$$\begin{aligned}
 25.1015 &= 4.4507165 \\
 \sin A &= 1.8765581 \quad 16.47 \\
 \sin a &= 1.7952127 \quad 3.724 \\
 4.2563577 & \quad 26.254
 \end{aligned}$$

$$54/37.804 = 1.4''$$

$$\begin{aligned}
 25.9.27 &= 4.4507165 \\
 \sin A &= 1.86871731 \quad 8.112 \\
 \sin a &= 1.7856707 \quad 8.615 \\
 4.3573231 & \quad 17.072 \\
 671 & \quad 37.504 \\
 54 & \quad 37.804
 \end{aligned}$$

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HOLMES & NARVER, INC.
ENGINEERS - CONSTRUCTORS
LOS ANGELES, CALIFORNIA

JOB NO. 176

SHEET 2 OF 2

BY M.R. DATE

TITLE

ANGLE HOISTMENT - VONNE

28,700.5'
SIN 11.3-14-43.5
(70748270)

8503.479
SIN 13-49-11.3
(27233270)

24,588.166
SIN 31-57-02.2
(70748270)

26,312.7'
SIN 7.9-53-52.1
(70748270)

14,625.214
SIN 33-10-32.0
(54720618)

24,589.000
SIN 6.6-55-35.7
(70748270)

D.F.F. 13

$$\begin{aligned} 28,700.5 &= 4,460,703 \\ \sin \alpha' &= 9.8462410 \quad 16.47 \\ \sin \beta &= \frac{9.9932141}{4.3503624} \quad 3.764 \end{aligned}$$

$$\begin{aligned} 26,312.7 &= 4,420,165.5 \\ \sin \alpha &= 9.9631596 \quad 8.910 \\ \sin \beta &= \frac{9.1664079}{4.3503624} \quad 8.610 \\ &\quad 17.580 \\ &\quad 6.04 \\ &\quad \underline{26} \quad 20.224 \\ &\quad 31.034 \end{aligned}$$

$$26/31.034 = 0.7''$$

28,700.5'
SIN 11.3-14-44.5
(70748270)

8503.47'
SIN 13-49-11.3
(27233270)

24,589.891'
SIN 31-57-02.7
(70748270)

26,312.7'
SIN 7.9-53-52.8
(70748270)

14,625.376'
SIN 33-10-32.0
(54720618)

24,588.75'
SIN 6.6-55-35.2
(70748270)

ADJUST: 24,588.124'

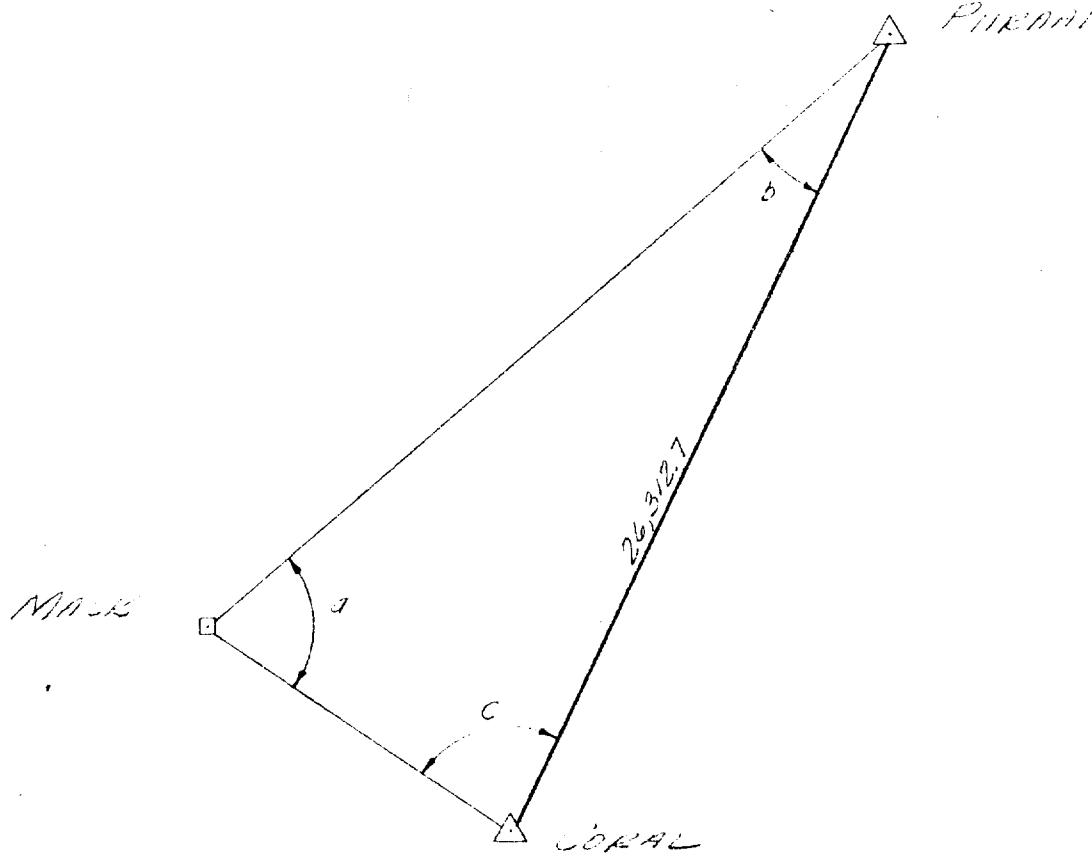
D.F.F. 05'

HOLMES & NARVER, INC.
ENGINEERS - CONSTRUCTORS
LOS ANGELES, CALIFORNIA

JOB No. 146
SHEET 1 OF 1
BY M.E. DATE

TITLE

ANNE HOLLOWAY - MINER



OBSERVED 4
a 42-27-45.6
b 21-15-15.1
c 116-16-55.1
1.8

ADJUSTED 4
42-27-47.2
21-15-15.1
116-16-55.7
0.0

26 31 27
IN 42-27-47.2
(+7572254)

14 12 57
IN 21-15-15.1
(36256656)

34 745 67
IN 116-16-55.7
(+7562450)

HOLMES & HARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMPUTED BY	DATE	JOB NO.	LOCATION
a 2	10-3	50.7	3 Bldg 102
ed2	+ 33 10	32.0	3d4
a	8	8	
ed2	25.7	25.7	
a	10-1	55.4	3 Bldg 101
a	47.8	47.8	ΔΔ
a	+	+	

FIG. 7. SCALE OF TRIANGLE 79-55-42.8

$\Delta \phi$	Logarithms of periods in seconds	Logarithms of periods in seconds	$\Delta \phi$	Logarithms of periods in seconds	Logarithms of periods in seconds
162.17	2.214	2.213	162.21	2.206	2.205
Δx	0.33395	0.33404	Δx	0.33395	0.33404
Δt	3.5	3.5	Δt	3.5	3.5

$\frac{1}{2}(\phi + \phi')$ // -2 π - 2 π s Logarithms | Values in
Logarithms | Values in CUSA & ECE 302
seconds

HOLMES & NARVER ENGINEERS-CONSTRUCTORS

COMPUTATION OF TRIANGLES

CALC. BY M.R.DATE 6/28/55JOB NO. 942

CHKD. BY _____

DATE _____

LOCATION YVONNE-MACK

STATION	OBSERVED ANGLE	CORR-N	SPHERICAL		PLANE ANGLE AND DISTANCE	LOGARITHM
			ANGLE	EXCESS		
2 - 3					8020.13	3.9041815
1 YVONNE	79-53-52.2	+0.4	52.3	0.0	52.8	0.0007856
2 CORAL	33-10-32.6	-0.6	32.0	0.0	32.0	9.735510
3 PIRAHAI	66-55-38.8	-3.6	35.3	0.1	35.2	9.9337510
1 - 3					4457.714	3.6441131
1 - 2					7494.732	3.8747561
2 - 3					8808.72	3.9449227
1 YVONNE	112-16-48.7	-3.9	44.8	0.0	44.8	0.0335715
2 CORAL	51-57-03.5	-0.4	03.7	0.0	03.9	9.8962422
3 PIRAHAI	15-48-12.1	-0.8	11.3	0.0	11.2	7.4351022
1 - 3					7494.737	3.8747564
1 - 2					2591.877	3.4136.44
2 - 3					8020.13	3.9041815
1 MAGER	42-27-48.6	+0.6	49.2	0.0	49.2	0.1706174
2 PIRAHAI	21-15-14.5	+0.6	15.1	0.0	15.1	9.5593155
3 CORAL	116-16-53.1	+0.7	55.8	0.1	55.7	1.9526106
1 - 3					4306.400	3.6341144
1 - 2					11,651.468	4.0274095
2 - 3						
1						
2						
3						
1 - 3						
1 - 2						

HOLMES & MARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMPUTED BY John C. Holmes DATE July 15, 1915

α	β	γ	DATE	NO. 2	LOCATION	YARDAGE	"
52° 4' 50"	32° 4' 50"	10° 57'	1915	32.4 57.1	Point 32.4	270° 29' 34.0	"
+ 51	- 57	- 53.9		3dL		- 155	11.3
Δα	Δβ	Δγ					
Δα	Δβ	Δγ					

α'	β'	γ'	DATE	NO. 2	LOCATION	YARDAGE	"
145° 23' 23.54	47° 25.7	25.7	1915	145.23 23.54	Point 145.23	180° 00' 00.0	"
- 180	- 180	- 180					
Δα'	Δβ'	Δγ'					
Δα'	Δβ'	Δγ'					

FIRST ANGLE OF TRIANGLE 112-14-48.7

α	β	γ	DATE	NO. 2	LOCATION	YARDAGE	"
112° 32' 16.80	22° 01.621	φ	1915	112.32 22.01.621	Point 112.32	32.000	"
- Δφ	- 31.726	Δφ					
φ'	21° 09.895	φ'					
Δα	Δβ	Δγ					
Δα	Δβ	Δγ					

Logarithms	Values in seconds	Logarithms	Values in seconds	Logarithms	Values in seconds
$\frac{1}{2}(\phi + \phi')$	3.8747554	$\frac{1}{2}(\phi + \phi')$	3.8747554	$\frac{1}{2}(\phi + \phi')$	3.8747554
Logarithms	Values in seconds	Logarithms	Values in seconds	Logarithms	Values in seconds
S	112.3250	S	112.3250	S	112.3250
B	9.5154927	B	9.5154927	B	9.5154927
H	1.77960.0	H	1.77960.0	H	1.77960.0
S ²	7.74201	S ²	7.74201	S ²	7.74201
sin α	0.5096676	sin α	0.5096676	sin α	0.5096676
sec φ'	0.2086946	sec φ'	0.2086946	sec φ'	0.2086946
-Δλ	1.7147053454.7260	-Δλ	1.7147053454.7260	-Δλ	1.7147053454.7260
sin(φ+φ')	0.30.4075	sin(φ+φ')	0.30.4075	sin(φ+φ')	0.30.4075
-Δφ	1.01511.6410.265	-Δφ	1.01511.6410.265	-Δφ	1.01511.6410.265
C	0.71627	C	0.71627	C	0.71627
G	0.432013	G	0.432013	G	0.432013
Sin ² α	0.25397	Sin ² α	0.25397	Sin ² α	0.25397
G	0.71355	G	0.71355	G	0.71355
2d term	+0.0000	2d term	+0.0000	2d term	+0.0000
G	0.71355	G	0.71355	G	0.71355
3d term	+0.0000	3d term	+0.0000	3d term	+0.0000
G	0.71355	G	0.71355	G	0.71355

Logarithms	Values in seconds	Logarithms	Values in seconds	Logarithms	Values in seconds
S	9.423250	S	9.423250	S	9.423250
A'	0.5096676	A'	0.5096676	A'	0.5096676
Sec φ'	0.2086946	Sec φ'	0.2086946	Sec φ'	0.2086946
-Δλ	1.7147053454.7260	-Δλ	1.7147053454.7260	-Δλ	1.7147053454.7260
sin(φ+φ')	0.30.4075	sin(φ+φ')	0.30.4075	sin(φ+φ')	0.30.4075
-Δφ	1.01511.6410.265	-Δφ	1.01511.6410.265	-Δφ	1.01511.6410.265
C	0.71627	C	0.71627	C	0.71627
G	0.432013	G	0.432013	G	0.432013
Sin ² α	0.25397	Sin ² α	0.25397	Sin ² α	0.25397
G	0.71355	G	0.71355	G	0.71355
2d term	+0.0000	2d term	+0.0000	2d term	+0.0000
G	0.71355	G	0.71355	G	0.71355
3d term	+0.0000	3d term	+0.0000	3d term	+0.0000
G	0.71355	G	0.71355	G	0.71355

COMPUTATION OF TRIANGLES

CALC. BY M.R. DATE 7/13/55
 CHKD. BY _____ DATE _____

JOB NO. 942
 LOCATION GENE

STATION	OBSERVED ANGLE	CORR - N	SPHERICAL		PLANE ANGLE AND DISTANCE	LOGARITHM
			ANGLE	EXCESS		
2-3					14,181.641	4.1517265
1 ALICE	48-59-21.0	+0.3	21.3	0.2	21.1	0.1222913
2 ENGEBI	97-23-04.8	-2.2	02.6	0.1	02.5	9.9463306
3 CORAL	33-35-38.5	-2.1	36.5	0.1	36.4	9.7427178
1-3					18636.674	4.2702684
1-2					10398.617	4.0169156
2-3					10378.617	4.0169156
1 GENE	153-13-56.1	-1.4	54.7	0.0	54.7	0.1764489
2 ENGEBI	23-30-57.7	0.0	07.7	0.1	07.6	9.6524754
3 ALICE	18-07-59.0	-1.3	57.7	0.0	57.7	9.4938366
1-3					6250.286	3.7956989
1-2					4867.002	3.6892611
2-3					14,181.641	4.1517265
1 GENE	44-58-59.3	-1.8	56.5	0.1	56.4	0.1529920
2 ENGEBI	121-01-12.5	-2.3	10.2	0.1	10.1	1.9327769
3 CORAL	14-01-53.9	-0.4	53.5	0.0	53.5	9.5846535
1-3					11303.547	4.3393814
1-2					47-7.003	3.6778413
2-3					17303.647	4.3393814
1 ALICE	67-09-28.0	-1.1	18.9	0.1	18.8	0.0354716
2 GENE	43-10-57.8	-0.6	58.4	0.1	58.3	9.7182165
3 CORAL	19-33-44.6	-1.0	43.0	0.1	42.9	9.5846533
1-3					18626.246	4.2702684
1-2					6250.287	3.7956989

FORM 1

HOLMES & NARVER INC. - ENGINEERS - CONSTRUCTORS

CALC. BY John H. Holmes

DATE May 1942

JOB NO. 942

CHKD. BY

DATE

SHEET NO. 1 OF 1

TRAVERSE Calumet Mine - Gandy - 1942

STATION	BEARING	DISTANCE	COSINE	SINE	CO-ORDINATES	
					NORTH	EAST
1 CAMP	N 30° 45' E	150.00	.8660	.5000	1000.00	0.00
2 ALICE	N 30° 45' E	150.00	.8660	.5000	1000.00	329.52
3 MINER	N 30° 45' E	150.00	.8660	.5000	1000.00	659.222
4 ENSE	N 30° 45' E	150.00	.8660	.5000	1000.00	988.91
5						
6						
7 ENSE	S 55° 30' W	164.042	.899	.438	144.527.9	336.2
8 ALICE	S 55° 30' E	150.00	.8660	.5000	132.931.2	237.237
9 GENE	S 55° 30' E	150.00	.8660	.5000	129.434.245	11.023.589
10 ENSE	S 55° 30' E	150.00	.8660	.5000	144.527.905	336.197
11						
12						
13						
14						
15						
16						
17						
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19						
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FORM T

HOLMES & NARVER INC. - ENGINEERS - CONSTRUCTORS

CALC. BY N.P.

TRAVERSE YVONNE (TRIANGULATION)

DATE 7/25/55

JOB NO. 942

CHKD. BY

SHEET NO. 1 OF 1

STATION	BEARING	DISTANCE	COSINE	SINE	CO-ORDINATES		NORTH	EAST
					LATITUDE	DEPARTURE		
1 <u>EDNA</u>	<u>N 25° 07' 44.5 E</u>	<u>14.625.200</u>	<u>.962.7245</u>	<u>.251.2546.400</u>	<u>N 25° 07' 44.5 E</u>	<u>14.625.200</u>	<u>112.301.0</u>	<u>112.504.5</u>
2 <u>YVONNE</u>	<u>N 25° 07' 44.5 E</u>	<u>24.344.924</u>	<u>.962.7245</u>	<u>.251.2546.400</u>	<u>N 25° 07' 44.5 E</u>	<u>24.344.924</u>	<u>106.354.300</u>	<u>106.557.656</u>
3 <u>EDNA</u>							<u>105.103.042</u>	<u>105.003.030</u>
4								
5								
6 <u>EDNA</u>	<u>N 25° 07' 44.5 E</u>	<u>3.625.457</u>	<u>.962.7245</u>	<u>.251.2546.400</u>	<u>N 25° 07' 44.5 E</u>	<u>3.625.457</u>	<u>129.891.5</u>	<u>129.891.5</u>
7 <u>YVONNE</u>	<u>N 25° 07' 44.5 E</u>	<u>3.594.3174</u>	<u>.962.7245</u>	<u>.251.2546.400</u>	<u>N 25° 07' 44.5 E</u>	<u>3.594.3174</u>	<u>106.354.535</u>	<u>106.353.306</u>
8 <u>EDNA</u>							<u>99.999.977</u>	<u>99.999.978</u>
9								
10								
11 <u>EDNA</u>	<u>N 25° 07' 44.5 E</u>	<u>14.625.200</u>	<u>.962.7245</u>	<u>.251.2546.400</u>	<u>N 25° 07' 44.5 E</u>	<u>14.625.200</u>	<u>112.601.0</u>	<u>112.554.5</u>
12 <u>YVONNE</u>	<u>N 25° 07' 44.5 E</u>	<u>8.505.487</u>	<u>.962.7245</u>	<u>.251.2546.400</u>	<u>N 25° 07' 44.5 E</u>	<u>8.505.487</u>	<u>99.583.365</u>	<u>99.553.521</u>
13 <u>EDNA</u>								
14								
15								
16 <u>EDNA</u>	<u>N 25° 07' 44.5 E</u>	<u>34.245.677</u>	<u>.952.40943</u>	<u>.291.81025</u>	<u>N 25° 07' 44.5 E</u>	<u>34.245.677</u>	<u>115.802.758</u>	<u>115.757.972</u>
17 <u>YVONNE</u>	<u>N 25° 07' 44.5 E</u>	<u>14.128.57</u>	<u>.962.7245</u>	<u>.251.2546.400</u>	<u>N 25° 07' 44.5 E</u>	<u>14.128.57</u>	<u>103.791.242</u>	<u>103.757.593</u>
18 <u>EDNA</u>								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								

HOLMES & HARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION SECOND ORDER TRIANGULATION

COMPUTED BY - M. E. DATE 7/11/55

FIRST ANGLE OF TRIANGLE 44-565-56.

ϕ	11 37 39 16.4 2 min E.B.	λ	162 14 55.181	θ	11 32 27.354	3. $\cos \alpha$	λ	162 17 11.144
$\Delta \phi$	38.717	$\Delta \lambda$	- 0.2	$\Delta \theta$	0.8	0.429	$\Delta \lambda$	- 54 56.616
ϕ'	11 40 00.831	λ'	162 12 19.333	θ'	11 40 20.683	1.554	λ'	162 12 19.294
Logarithms	Values in seconds					Logarithms in seconds	Values in seconds	
s	3.4872646	$\frac{d}{d}(\phi + \phi')$	11 - 40 - 01.324	s	4.2356053	$\frac{d}{d}(\phi + \phi')$	11 - 35 - 25.463	
$\log \alpha - 3.3893929$		Logarithms	Values in seconds	Gos. α	1.9325631	Logarithms	Values in seconds	
B	4.7124740	s	3.672610	B	3.51247497	s	4.2356252	
h	- 1.5980539	1st term	38 7506	Sin α	1.9866135	1st term	40.04720	Sin α
g^2	7.27454	A'	8' 55.83	λ	2.6246047	A'	1.1045553	
$n^2 \alpha$	3.97552	Sec ϕ'	1.980752	θ^2	6' 47.121	Sec ϕ'	0.0070752	
C	6.72134	$\Delta \lambda$	21.1226161	$\Delta \theta$	155 31.75	$\sin^2 \alpha$	9.42091	
$\Delta \lambda$	21.1226161	2d term	+ 0.0117	Sin θ	1.716509	$\Delta \lambda$	2.464822	29.643
$\Delta \theta$	- 0.044425	$\sin^2(\phi + \phi')$	9.3258224	θ	0.611851	2d term	+ 0.0406	$\sin^2(\phi + \phi')$
n^2	3.1214	$\Delta \alpha$	1.4954425	λ	5100	θ^2	5.3432	- $\Delta \alpha$
D	1.94657	3d term	+ 0.00020	0	1.94657	3d term	+ 0.0022	- $\Delta \phi$
			- 26.7134					

HOLMES & HARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION SECOND ORDER TRIANGULATION

DATE 6/28/35

COMPUTED BY	M.L.	JOB NO. 942	LOCATION
a 2 COHEN	10 3 C'COEN	41 0 51 1 26.1 "	a 3 COEN 10 2 COEN 221° 50' 50.7 "
b 8	8	+21 15 15.1	3dL 8
c 2 PHILLIPS	10 1 MACK	63 06 41 2	a 3 COEN 10 1 MACK 105 33 54.9
d -	-	- 01 02 9	Δx - 27.4
e		180. 00 00.0	180. 00 00.0
f 1 MACK	10 2 PHILLIPS	242 05 38.3	a' 1 MACK 10 3 COEN 285 33 27.5

FIRST ANGLE OF TRIANGLE 42-27-42-2

Logarithms	Values in seconds	Logarithms	Values in seconds	Logarithms	Values in seconds	Logarithms	Values in seconds
s 4.0214295	11-34-16 24.9	s 3.63431144	Cos a 9.42386783	s 3.63431144	1st term 37.6090	s 11-32-39.554	
Cos a 9.65333249	A' 8.50966776	B 9.924997	B 9.924997			Sin a 9.9237731	
B 6.5124180	s 4.0274095	n 1.5132924	1st term 37.6090			A' 8.50966776	
n 2.952924	1st term 153.7606	Sin a 9.9237731				Sec a 9.0088837	
s ² 8.05482	sin a 9.9237731	s ² 7.26823				Sec φ 9.0088837	
sin ² a 9.40362	A' 8.50966776	sin ² a 9.924997				Δn 2.1364335 / 36. 9/11	
c 0.71377	sec φ 9.0088837	Δn 2.1364335 / 36. 9/11				2d term + 0.0090	2.30122952
e 6.7421	2d term + 0.00472	sin(φ+θ) 9.3022941	7.25247			- Δn 1.437770	27.3991
f 4.3906	- Δa 1.7185702	sin(θ+φ) 9.3022941	n ² 3.1506	D 1.90545			
D 1.9564		- Δa 1.7185702	62.8883	5.1351	3d term + 0.0000		
G 277.0	3d term + 0.0002			- Δφ 37.0000			
	- 45.6260						

HOLLYS & HARVER, INC.
ENGINEERS-CONSTRUCTORS

POSITION COMPUTATION

DATE 7/15/55

COMPUTED BY M. E.

SECOND ORDER TRIANGULATION

	JOB NO.	LOCATION	GENE	"
4d	12 ENG 881 to 3 Copeac	243° 08'	00 22"	
2d	8	+ 97 25'	02 22"	
4	2 ENG 881 to 1 Alice	80 32'	- 01 08.4'	
Δα		-	Δα	
Δα		180 00 00.0	180 00 00.0	
Δα	1 Alice to 2 ENG 881	260 31 54.4'	1 Alice to 3 Copeac	309 31 15.3'
FIRST ANGLE OF TRIANGLE 48-59-21.3				
φ	11 39 46.62 ENG 881	162 14 55.15'	90 32 20.54" 3 Copeac	7 162 17 10.94"
Δφ	- 35.617	Δα - 05 38.644	Δφ + 06 26.094	Δλ - 07 54.437
φ'	11 38 46.547 1 Alice	162 09 16.507	11 39 46.348 1 Alice	λ' 162 09 16.507
Logarithms Values in seconds				
s	$\frac{1}{2}(\phi + \phi')$ 11-39-14-55.6	162 14 55.15'	s 4.2703684	$\frac{1}{2}(\phi + \phi')$ 11-35-53.30
Logarithms Values in seconds				
s	0.0169255	9.83331472	s 4.2703684	Logarithms Values in seconds
B	0.3153092	8 05124987	B 0.3153092	4.2703684
h	1.7447747 1st term	sin α 1.7346667	h 2.58081553 1st term 1304.2071	sin α 0.9811069
s ²	0.033395	A' 0.5096367	s ² 0.54074	A' 0.5096367
sin ² α	0.98813	sec φ' 0.6090343	sin ² α 9.77422	sec φ' 0.6090343
C	0.72137	Δλ 2.529774.4' 359.6440	C 0.7766.9	Δλ 2.6761782 474.4366
C	0.74347 2d term + 0.0554	sin ² (φ + φ') 9.8059512	9.0376.5 2d term + 0.076	sin ² (φ + φ') 9.3030904
D	3.43575	- Δα 1.9330946 68.4060	n ² 5.1736	- Δα 1.9792606 95.3565
D	1.98617	D 1.9845	D 1.9845	D 1.9845
D	5.4754 3d term + 0.0000	7.1581	3d term + 0.0014	- Δφ - 388.9937
Δφ	55.6170			

1990-1991 学年 第一学期
高二年级生物科期中考试卷

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